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We want to obtain examples of current foundry practice. Photographs, drawings and descriptive matter, showing just what is being accomplished in the foundries of to-day, will be cheerfully paid for.

We can not furnish a continuous set of back numbers beyond April 1900.

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Trade Outlook.

The past month has been one of extreme quietness as far as the foundry trade has been concerned. The voluntary reduction in the price of its product made some time ago by one of the large factors in the iron trade resulted in throwing the market into a state of uncertainty as far as prices were concerned, and buyers of pig iron have only been making purchases in a sort of hand-to-mouth fashion, except where the price to be paid has been made to cover those ruling at the time of delivery.

Stock jobbers in Wall street are generally credited with having precipitated the present situation as is voiced by one of the prominent men connected with the Tennessee Coal, Iron and Railroad Company, at Birmingham, Ala., who, speaking of the condition of the iron business in that region, says:

"There is absolutely no reason for a legitimate slump in the iron market. In the first place, there is a tremendous demand for export iron. The iron centers of Europe are insistent in their call for American pig iron and this demand will result in the exportation of a large amount of the American product, especially from the South. For the next eight months the furnaces are sold to within fully half of their total manufacturing capacity. There may be temporary slumps, caused by men with a desire to influence the prices of stock, but the market is founded on the facts and there is no room for a legitimate slump."

The secretary of another steel and iron company, commenting on the business and the general situation, and particularly as to the "slump" in the iron market, recently said:

"It is a speculative affair altogether, and we have nothing whatever to do with it. The pig iron market is still strong and quotations are firm. There have been no concessions made by our company. There is a good demand for export iron. The steel men's action may have some effect on the purchasing of iron, but it will not on the general conditions."

Rogers, Brown & Co., in a recent review of trade, say:

"The volume of business for the week under review has not been large, though deliveries on former contracts have been heavy and urged forward by customers. The demand during the week has been principally for Southern No. 2 foundry and charcoal irons in general. Chilling charcoal grades are very scarce and in demand beyond supply. Standard Bessemer and basic are strong, with light offerings. The melt has been maintained well considering the strikes and threatened interruptions by labor difficulties at many important consuming points. The able committees representing the labor organizations and manufacturers in the foundry lines, that have met in this city this week, have wisely met with dignity on middle ground of agreement, averting, it is believed, a strike of the molders in this city and other important centers."

Matthew Addy & Co. say of developments during the early part of May:

"A decided change in feeling regarding pig iron has taken place. When the great disturbance in finished steel products first occurred it looked for a time as if the entire market were bound to be stampeded. That apparently was the aim of the raiders, and all Wall Street joined in the bear movement. But the pig iron market has not been stampeded and business is slowly beginning again. Of course there is no denying the fact that for a time confidence was so shaken and the future appeared so uncertain that buying practically ceased. There were a few buyers who tried to take advantage of the situation to cover on round lots at extremely low prices. They did not succeed, finding no iron offered. The statistical position of the market forbids the idea of any serious break. The transactions of the past week, while not large, have been fair, all things considered. There is a number of inquiries at present in the market and the outlook for business during the latter part of the month is excellent."

Aside from the retarding influence of the general demand of the molders for a higher rate of wages in some of the principal foundry centers, the coremakers have also in some localities helped to complicate the situation by demands for greatly increased remuneration. The compromise effected with the molders has, temporarily at least, tided over what threatened to become a serious conflict.

The Apprentice Ratio.

It is a difficult task to formulate a set of rules to govern a trade, that shall at the same time be satisfactory to both employer and employe. The manufacturer, on the one hand, is interested in having a plentiful supply of mechanics from which he may at all times draw such a number as will meet the demands for his product. On the other hand, the employes do not desire a large body of idle men in their respective trade, on account of the demoralizing effect on wages and general conditions which this carries with it.

If the demand for skilled mechanics in any trade would remain uniform year after year the question of apprentices would be comparatively easy of settlement. Unfortunately this is far from being the case. Within the last few years we have all known the time when there was two molders for every job, and again when it seemed as if two jobs were waiting for every man. It is obvious that no agreement, no matter how liberal in its ratio of apprentices, can be elastic enough to supply such fluctuations in the demand for mechanics upon short notice.

It is not far from the truth to say that we all try to earn our money as easy as possible. If a young man learns the trade of molding and times become slack, he will if he possesses any inherent ability turn his hands to something else. He cannot afford to remain idle; he will not do so if he amounts to anything. It is true the trade may tempt him back again, but more often he will have found a vocation offering him steadier employment, and the years he spent as an apprentice in the molding shop are practically lost, not only to him, but to those who gave him his early training.

The general jobbing shop is always the first to feel the lack of competent mechanics when the volume of business increases, and the first one to place its men on the road when times are dull. All that can be written will probably not help the least towards establishing a steady demand for molders at all times, and yet as long as we have periods of busy and slack trade, just so long will we have complaint of a lack of skilled mechanics at one time and a surplus at another.

Krank's Korner.

Hard spots in castings is an annoying feature in many shops. Generally they are to be found only in comparatively light castings, such as pulley rims and other castings which cool rapidly. Rapid cooling produces hardness, as is witnessed wherever iron is cast upon a chill. I am also inclined to think that wet sand will promote rapid cooling, but Wm. Speara, of Columbia, Pa., seems to think differently, judging from the following assertion recently made by that gentleman:

"The idea that wet sand causes hard castings is a delusion—a shield to get behind, when bad mixtures are responsible. I have tests in my possession made from time to time, that go to prove that the statement is erroneous. My claim is that if the iron is put to the melting point and sent through without chilling on the way to the bed, and the mixture is right, it can be run through water

or over ice and the result will be right. Wet sand and water swabbing cut no figure. I should like some light on the cause of hard iron when the mixture is right."

Somehow or another I feel that Mr. Speara is not very sure of his ground. Else why should he have asked the cause of hard iron when the mixture is right. If the mixture is right, the cause of unsatisfactory castings must be sought outside of the mixture. And I don't think for a moment that I should have much trouble in putting a few hard spots in a light casting from any mixture Mr. Speara could prepare.

I think a reckless use of the swab will help to make Mr. Speara's machinists rather profane. If this shouldn't quite bring them, a few hard rammed spots might possibly do so. Iron will not lay still on a hard surface, and in boiling, as it will do, we have practically the same effect as if the iron was puddled. The hard spot is confined to that part of the casting where the iron boils.

* * *

Some surprise his been expressed in many quarters that the "per capita output" of the majority of establishments has been lowered within the past year. Several trade journals have seized this feature of prosperity as a text for sermons on the general cussedness of the employe, although I for one do not believe he is responsible.

* * *

Keeping to things with which we are all familiar, let us for illustration take a foundry. As long as there were more molders than jobs the employer could have his choice of workmen. During this period a shop would likely have a permanent set of men who, becoming better and better acquainted with the patterns of the shop, were continually increasing their output. Now the only trouble with the proprietor of this foundry is that he did not try to retain these workmen.

Instead of saying to himself: These men, through prolongeu service, are worth more to me than strangers and I will make it an object for them to remain, he is likely to pay them as small a sum as the minimum rate of the molders' union will allow.

Other foundries become in need of men and offer inducements which cause employes to change. New men are hired to fill their places, but the output shows a certain drop, for which they are not to blame. The men who were familiar with the work have been exchanged for others who must learn, and if the employer prefers the latter why it is his funeral, and I don't feel he has any reason to kick.

Brass Furnaces.

BY PAUL WEVER.

The illustrations of a brass furnace which appeared in THE FOUNDRY for December, 1899, gives me an excuse for adding my mite to the subject.

The brass foundry is a place that is well worthy of being brought to the highest state of perfection. There is good money to be made if a shop is conducted as it should be and if the opposite is the case there is a great chance to run behind.

Some of the styles of brass furnaces which have been in use on the continent of Europe for a long while are as far as I have learned but little known in the United States. In this article I will try to show among other things the melting capacity of these furnaces, their diameter and height, area of wind pipe and size of crucibles together with the length of time occupied in melting. We will also consider the quantity of fuel consumed, the blast pressure needed, the cost of erecting a complete plant and the cost of smaller items and crucibles. In dealing with the latter, the number of heats the crucible will stand melting copper, bronze or brass will be looked into.

The great amount of fuel consumed and the long time occupied in melting a comparatively small amount of metal in the ordinary way, led the continental brass founders to experiment with a view of finding a better system. The first attempts made to improve the brass furnace were made by Mr. Piat and Mr. Rousseau, both of Paris, France.

The trials and experiments of both were practically conducted along the same line and had for their object the saving of fuel through bringing about a more rapid combustion by introducing a forced draft to the fuel chamber of the furnace. The results first obtained by these inventors' labor justified them in believing that not only would such a furnace consume less fuel and per-

form its work in far less time, but that the saving in crucibles would also be an item of considerable importance.

By keeping the crucible uninterruptedly in the fire it is not subjected to the many changes of temperature which take place in the ordinary furnace when the crucible in which the brass is melted is removed at each heat in order to empty it of the metal. By the plant followed by Messrs. Piat and Rousseau the crucible is held securely in a fire-brick lined casing, the latter, together with the crucible, being lifted upwards and then tilted to empty the crucible when the melting operation is completed. Since no tongs are used the crucible can not be injured by them. These and other apparent advantages renders the system of furnace construction adapted by Piat and Rousseau of more than ordinary interest.

The furnace illustrated by Mr. Robert Wagner in the December Foundry is either modeled after Mr. Piat's designs or built by that gentleman. The patents of Mr. Piat were bought by his former representative, Mr. R. Baumann, of Oerlikon, Switzerland, who has made several improvements, small as regards the system, but far-reaching in increasing the efficiency of the furnace.*

Fig. 1 shows the general construction of the Piat-Baumann furnace, which differs from the furnace previously illustrated in this journal in that the moving of the hand-wheel A is all that is necessary to elevate the casing containing the crucible and empty the latter of its metal, whereas in the original Piat furnace the casing must first be lifted by a separate mechanism and then tilted by a lever.

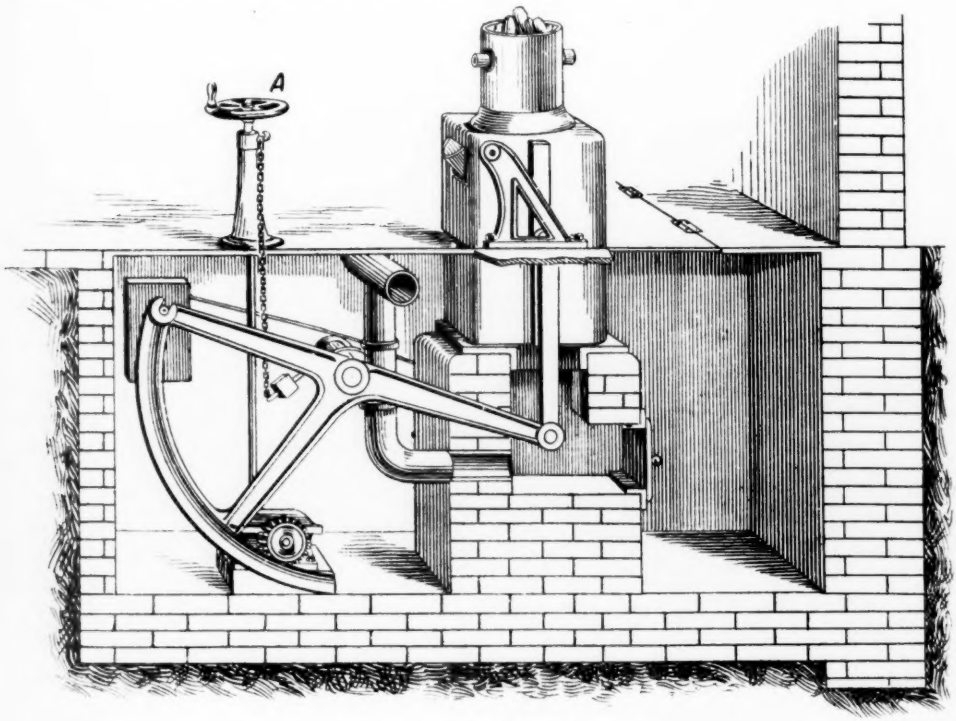


FIG. 1

PIAT-BAUMANN BRASS FURNACE.

The turning points BB, Fig. 2, and the spout C have to be arranged in one line, so that the pouring crucible D can always remain in the same position and does not have to be shifted around to suit a furnace which changes its position as does the one illustrated in the December Foundry. There is another advantage to the Piat-Baumann furnace in that one man is able to handle it and can see just what is occurring at all times.

*If we remember rightly, the Piat furnace is controlled in the United States by the Ajax Metal Co., of Philadelphia.—[Ed.

while with the style shown by Mr. Wagner the operator remains in the background and can consequently not tell just how far the furnace must be lifted before it is in the proper position to empty, unless some one assists him. E, Fig. 2, is a hopper for introducing the metal to the furnace and is removed and replaced with the cover F, when melting has ceased.

The greatest advantage is obtained in these furnaces when a crucible as large as possible is used. As far as I know a three hundred kilogram crucible is now the maximum. The time and fuel consumed in melting this amount is relatively no greater than required to melt fifty or a hundred kilograms. The amount of preparation necessary is about equal in both cases and the saving in crucibles and fuel is considerable over what would be effected through the use of the smaller sizes. At present my endeavors are concentrated as much as possible upon the feature of enlarging the quantity melted at a heat.

With four inches of water pressure we can melt three hundred kilograms in two hours, with six inches, an hour and a half is sufficient, while with eight inches but fifty minutes are required. There are several points to look after, in my opinion the most important is even distribution of the blast, in order that the crucible may be maintained at a uniform heat throughout its body. There should not be one part of the crucible which should be hotter than another from the time of lighting the fire until the end. In practice I do not maintain a uniform pressure throughout a heat but regulate the blast according to the amount of coke in the fire, starting with the blast valve open and grad-

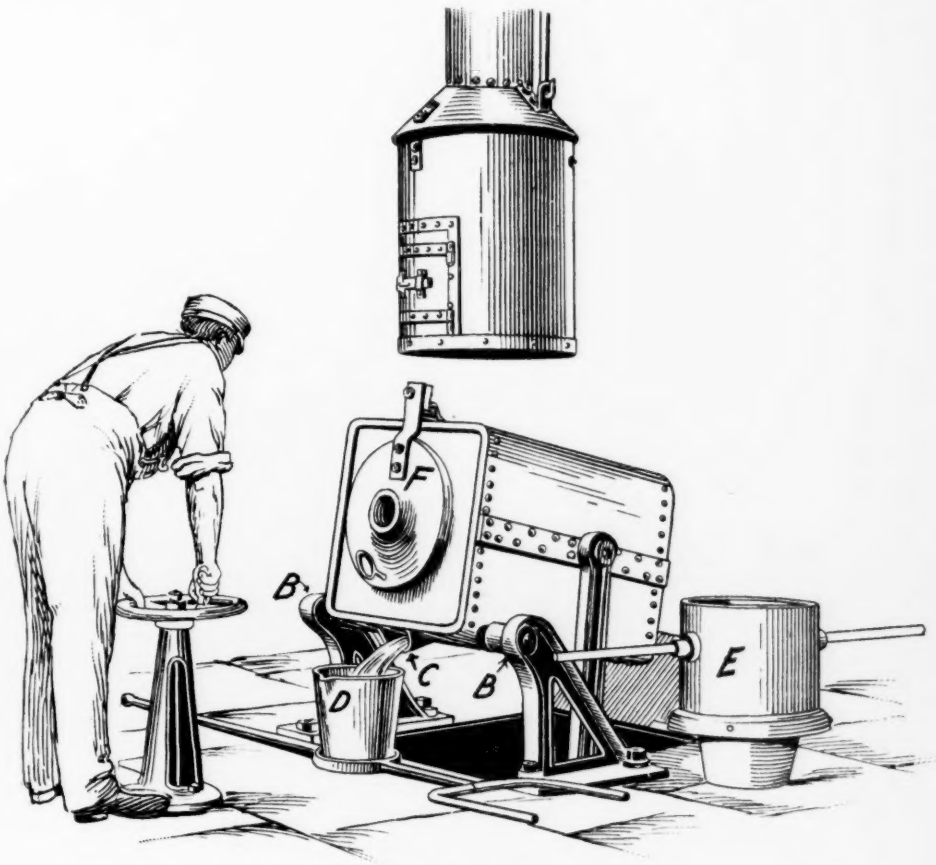


FIG. 2

PIAT-BAUMANN BRASS FURNACE

ually closing same as the fire recedes. In doing this I take it for granted that the furnace is so proportioned that one charge of metal is melted with one charge or filling of coke.

Fig. 3 shows the tuyere arrangement patented by Mr. Baumann. In ordinary furnaces it takes considerable time before the upper

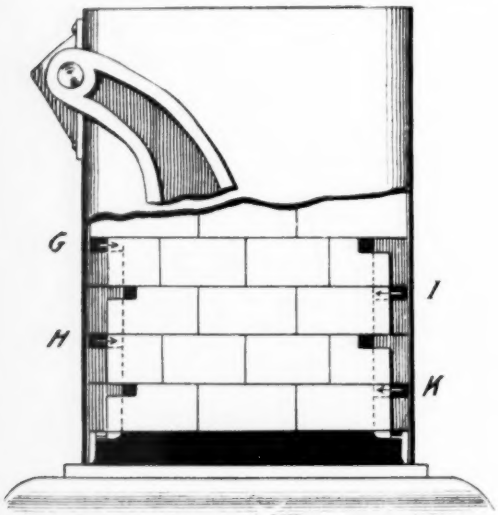


FIG. 3 A

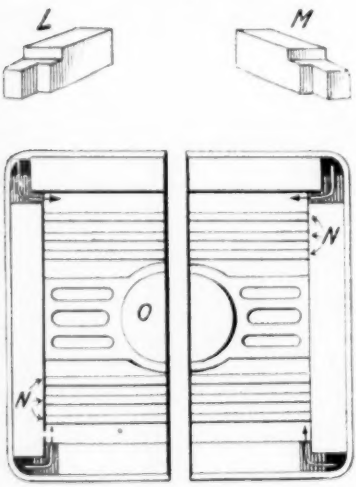


FIG. 3 B

part of the coke is ignited and clinkers on the grates may prevent equal combustion. In the Baumann system of blast distribution the air is forced through vertical channels in the corners of the brick lined casing and enters the furnace horizontally at different heights, changing its direction with each row of bricks as shown at G, H, I and K, Fig. 3 A and cross section Fig. 3 B. L shows the form of firebrick used for one tuyere and M the form used for the opening in the adjoining corners. Fig. 3 B also shows the loose grate bars N, which facilitate the cleaning of the furnace. The grate marked O remains stationary.

Your previous description of the purpose for which a hopper is used on these furnaces is to my mind insufficient. Certainly it facilitates the introduction of the metal into the furnace, especially such scrap metal as chips, borings and wire cuttings as the cover never has to be removed from the furnace as in the common style of construction. The main idea of the hopper is however to utilize the waste heat and gases, as they pass upwards, to heat the metal before it finally descends into the crucible. In Fig. 4 the lengthening piece P plays an important part in heating the whole mass to a red heat. The scrap will not melt in the hopper but comes down to the crucible heated to softness and in a very short time is converted into fluid metal.

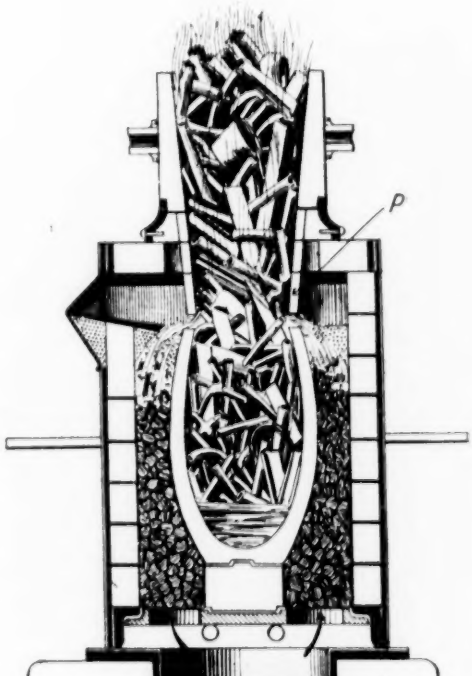


FIG. 4

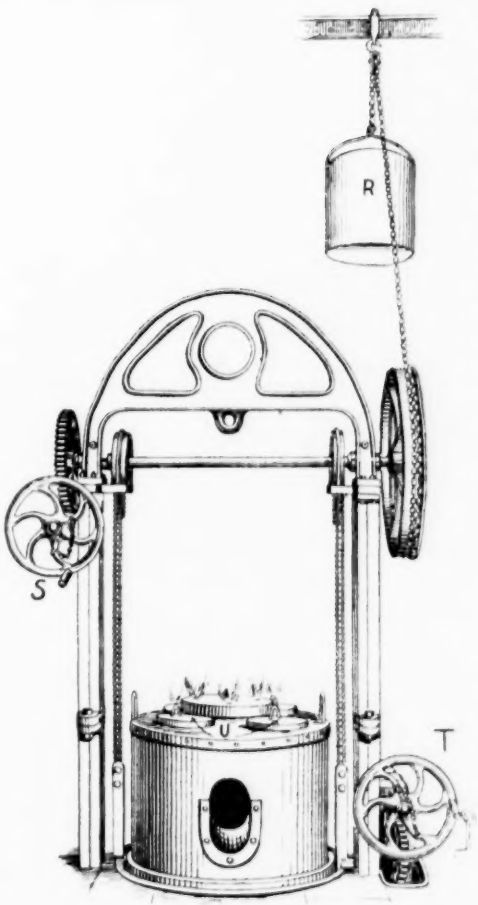


FIG. 5

ROUSSEAU FURNACE.

The more rapid metal can be changed from the solid to the fluid state the less loss will there be from oxidizing and the heat to which the metal is subjected in the hopper materially shortens the time of melting a charge. In my opinion the proper name for the hopper is a pre-heater, as it fills this office more than any other. The shape of the hopper is changed to suit different classes of metal, whether ingots, old wire or any other material.

The amount of coke used in a Piat furnace depends on its quality and the kind of metal to be melted. Where a furnace can be kept in continuous operation, melting from ten to fifteen heats per day, the fuel consumed will vary between fourteen and twenty per cent, including what is used at the start for a heat. Where the furnace is run intermittently the fuel consumption will of course be higher.

The cost of a Piat furnace, capable of accommodating a 150 kilogram crucible, varies from 2,000 to 2,500 marks, the foundation will cost in the neighborhood of 400 marks and the fan and piping for a plant consisting of say eight furnaces will cost about 1,000 marks more. (A mark equals 23 cents.)

The melting crucible in a Piat furnace will stand on an average about sixty heats. Sulzer Brothers, of Winterthur, Switzerland, state that their crucibles average 83 heats, the weakest standing 73, while 97 has been the maximum number of heats obtained. In this connection it is but fair to mention that these results have been attained only through the use of a special preparation, ap-

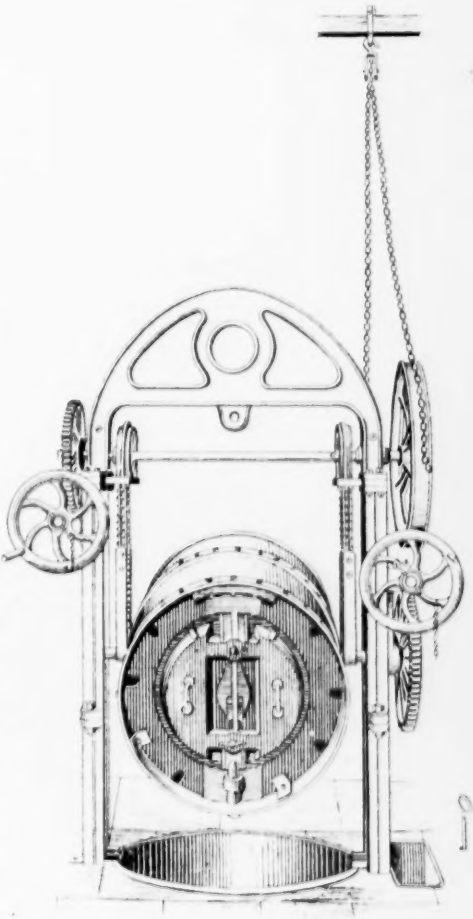


FIG. 6

ROUSSEAU FURNACE.

plied to the crucibles, invented by Mr. Baumann.

The construction of the Rousseau furnace, made by Basse & Selve, of Altena, Westphalia, Germany, may be judged from Fig. 5. The main idea in this and the Piat furnace are identical as far as a stationary crucible in a movable casing and mechanical draft are concerned. The casing containing the crucible is counterbalanced by the weight R and is lifted by moving the handwheel S, and tilted with the aid of the handwheel T. Personally I do not think that this is the best form of construction, as the handling of the furnace is not facilitated by having the whole mechanical arrangement above the floor.

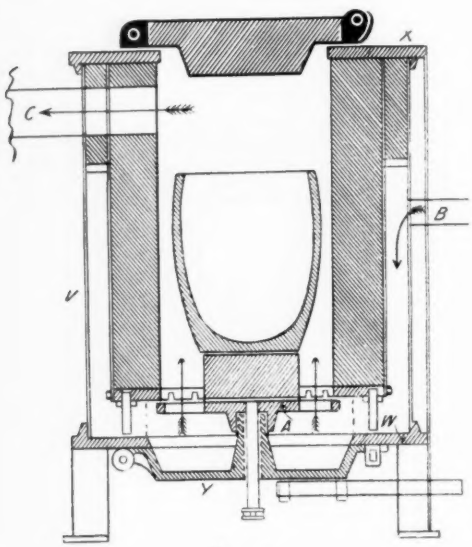


FIG. 7

An advantage claimed by Rousseau over the Piat furnace is that fuel can be supplied during the melting operation or at any other time through the four holes U, but in my opinion this is immaterial as one filling of the furnace is more than sufficient to complete the melting of one heat. The feeding of the furnace through the apertures shown would consume too much time to result in any advantage.

Fig. 6 shows the tuyere arrangement of the Rousseau furnace. I do not admire the grate used in some as it is difficult to keep clean and should a crucible break during melting, the liquid metal running down will weld the grate to the casing, making them difficult of separation.

Between the two systems I give preference to Piat's, but must admit that each possesses disadvantages. One difficulty common to both is that there is no way of judging the exact moment when a crucible will give way. A broken crucible can not be directly replaced as time must be given the furnace to cool sufficiently so that it can be handled. In our works we give the melter a premium for each charge the crucible stands over forty heats, but he must exercise great care. If in his judgment a crucible will not stand a full day's work a new one must be fixed up before starting. By following this method but few breaks occur with us during melting.

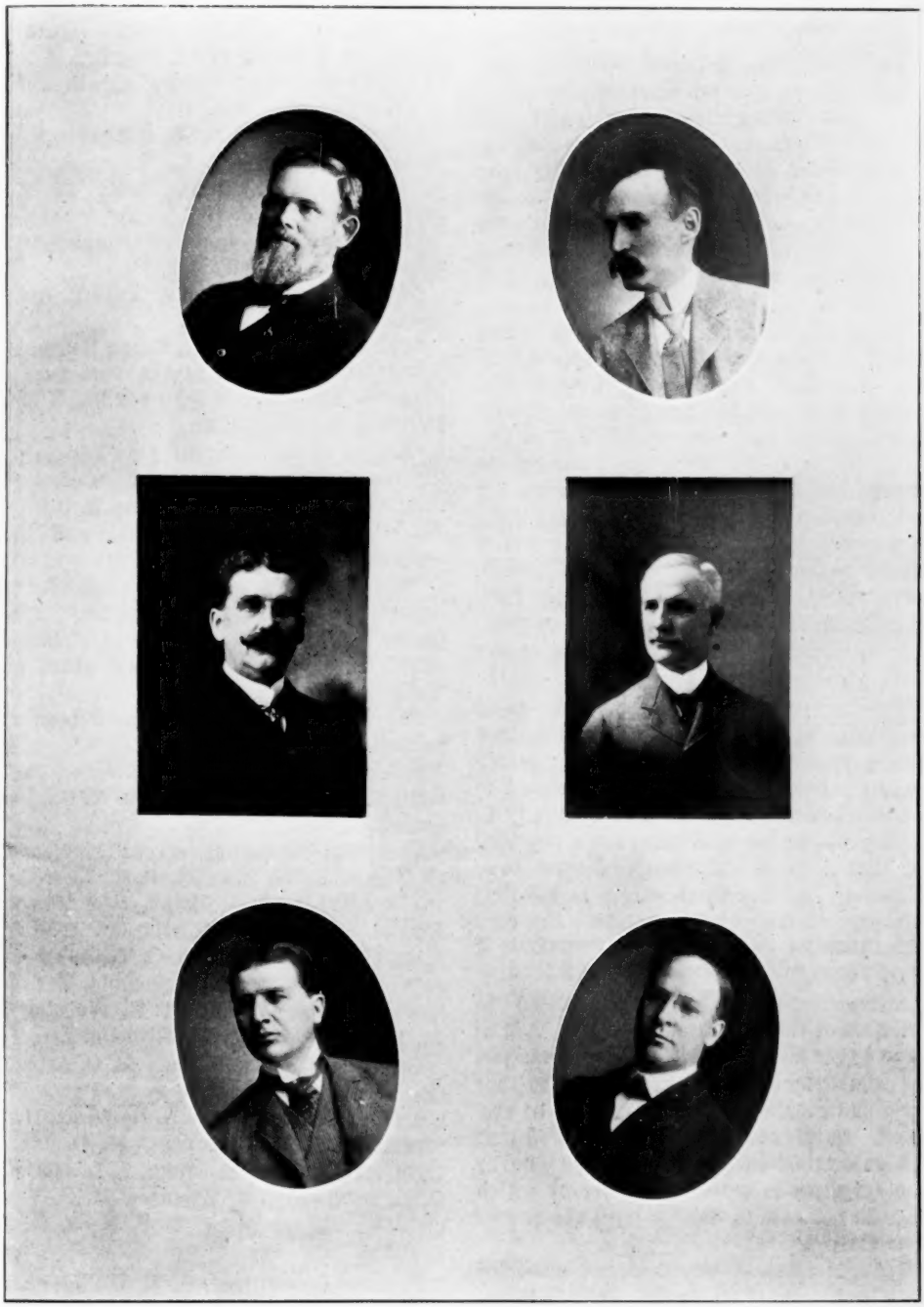
Another drawback to these furnaces is that in removing the metal from the large to the smaller crucibles, it loses considerable heat; sufficient at times to cause the loss of light castings. Of course this can to some extent be guarded against as the metal can be poured back into the larger furnace and reheated. It has been my experience that the Piat and Rousseau furnaces are chiefly to be preferred for the heavier class of castings.

For small castings I prefer a furnace like Fig. 7, where the crucible used for melting is also used for pouring. In this, V is the outer casing, W cast iron bottom plate; X cast iron top plate. The bottom plate is closed in by a chambered casting Y which can be dropped, supported as it is by hinges. On the chambered casting Y the grate A is placed, being held in place by two bolts so that the chamber Y may be dropped alone or together with the grate when the bolts are removed. The air enters at B and the gases escape through the flue at C; the blast may be regulated through blast gates placed in the windbox and flue.

Where economy is desired the waste gases and heat from the furnace may be utilized to dry cores and molds. This is all the more feasible where a number of furnaces are employed at the same time.

Nuff Said.

Just as if the meeting of American Foundrymen in Chicago, June 5, 6 and 7, was not enough in itself to draw out a crowd, those who have the destiny of the Plumbago Club in their hands announce that this famous organization will hold one session during the above meeting. The password may be obtained from the Plum—Plum—Ji.



W. A. JONES
M. C. ARMOUR
H. H. ROBERTS

P. W. GATES
B. T. BACON
B. M. GARDNER

A group of prominent Chicagoans who are working hard to make the coming Convention of American Foundrymen a success.

The Chicago Convention of the American Foundrymen's Association.

Every indication points to a very successful convention upon the occasion of the next meeting of the American Foundrymen's Association in Chicago June 5th, 6th and 7th. A number of very active committees have been hard at work and in spite of some discouraging circumstances, there is every prospect that the Chicago meeting will be one of the most memorable in the history of the organization.

The headquarters will be at the Great Northern Hotel, one of America's most famous hostelries, where every arrangement looking to the comfort and pleasure of those in attendance has been provided. The sessions will be held in what was formerly the "Palm Garden" or Auditorium upon the top or nineteenth floor, which is splendidly lighted and ventilated, giving a magnificent view of the entire city, lake, etc., and which, owing to the height affords freedom from dust, noise, etc., and will make the most attractive meeting place for a gathering of this kind.

The committee on exhibits are doing everything in their power to make this likewise a prominent feature and every manufacturer or dealer in anything of interest to foundrymen will be given an opportunity to display his wares in a large room provided for that purpose. The entertainment committee are making extra efforts to see that this part of the program receives the care and attention that has always made it a conspicuous feature of these Conventions.

Arrangements are being completed to carry all of those in attendance on a visit to some of the large foundries and manufacturing establishments, and in addition to that the usual evening entertainment will be provided. In this connection, it is rumored that the entertainment committee have one or two surprises in store the nature of which they do not care to discuss until the proper time arrives.

Reduced rates of one fare and one-third have been granted on all the railroads in the country and it is confidently believed that this meeting, judging from present indications, will exceed in point of attendance all its predecessors.

An attractive program has been arranged for in the way of papers to be read at this meeting, the list up to date being as follows:

"Mixing and Melting of Iron for Hydraulic Work." R. P. Cunningham, Holyoke, Mass.

"Crystallization of Metals." Edwin B. Gilmour, Milwaukee, Wis.

"The Real Fuel Ratio." L. C. Jewett, North Attleboro, Mass.

"Foundry Management." James A. Murphy, Elizabeth, N. J.

"The Training of Foundry Chemists." Dr. Edward Kirk, Philadelphia, Pa.

"What are Improvements." Paul R. Ramp, Aurora, Ill.

"Flasks." Eli H. Pearce, Baton Rouge, La.

"Training Students in the Principles of Scientific and Commercial Founding." Thos. D. West, Sharpsville, Pa.

"Report of the Committee on Standardizing the Testing of Cast Iron." Committee composed of Thos. D. West, Jas. S. Stirling, Jos. S. Seaman, Jos. S. McDonald and Richard Moldenke, Chairman.

"Report of the American Foundrymen's Association Standardizing Bureau." Committee composed of Dr. Richard Moldenke, James Scott, P. W. Gates, E. H. Putnam and Thos. D. West.

The folowing committees have been appointed:

Executive Committee—W. A. Jones, chairman; P. W. Gates, Treasurer; B. M. Gardner, Secretary.

Reception Committee.—C. A. Plamondon, chairman; P. W. Murphy, S. J. Llewellyn, F. C. Vierling, W. H. Stockham, John Ramsey, Geo. M. Sargent, J. H. Harris, Jas. A. Brady, E. D. Green, L. W. Noyes, O. T. Stantial, J. L. Hotchkiss; Wm. Ferguson, Robt. Tarrant, H. B. Utley, H. W. Hoyt, T. K. Webster, A. M. Eddy, Jas. Frake, W. J. Chalmers.

Entertainment Committee.—M. C. Armour, chairman; S. T. Johnston, P. M. Baumgardner, H. E. Pridmore, Geo. A. Davidson, H. L. Williams, W. W. Backman, H. G. Lloyd, Irvin McDowell, C. L. Minor, I. L. McCord, D. L. Cobb, John J. Wagoner, H. S. Vrooman, W. H. McCarthy, C. S. Reed, G. R. Brandon, B. T. Bacon.

Finance Committee.—C. J. Wolff, chairman; E. C. Greenlee, C. P. Wheeler.

Exhibits Committee.—B. T. Bacon, chairman; J. H. Whiting, S. T. Johnston.

Press Committee.—H. H. Roberts, chairman; W. A. Jones, Chas. French, John A. Penton, B. M. Gardner.

A Brass Foundry Reminiscence.

BY K. K.

The old foreman of the shop in which I received my initiation into the mysteries of the trade was quite a character. He was a large man traveling along in the sixties; his hair was gray, but had once been red, and showed it. His face was large and red as a beet, and he had a stomach like an alderman. He had his moods like the best of us, and when he was in a good temper he was angelic, but when in a bad one a tyrant, but he could be bluffed, and we boys soon knew it.

When in one of his fits he would stride up and down the shop like a caged lion, everything from politics to the weather, and everybody, from the head molder to the core boy, came in for a share of his abuse. After a while he would generally select one of the apprenticee boys as the especial object of his wrath, and would settle down to "watching" him. He would stand at the end of that particular floor, with his arms hanging straight by his sides, nervously clenching and unclenching his fists, gnashing his hands we called it, and count the molds. Then he would "begin." The boy was "behind." He was shirking and so on ad infinitum.

His patience exhausted, Mr. Apprentice would spring his stereotyped bluff. He would throw down his tools, turn his back to the bench, sit and fold his arms defiantly. Then the storm would burst, reach its climax and end in the usual manner. The boy would quit, but before he could get out of the shop, which you can rest assured he was in no hurry to do, he would be hired back, and the moral atmosphere being cleared by the storm there would be peace. But with all his faults he was a kind-hearted man and a good mechanic, and if everybody in that firm did not know the latter fact it was not for want of telling.

His especial hobby was metal mixing, and every departmental foreman that came into the shop was buttonholed and made to listen to the old, old story. He had at some time or other in his carrer worked in an "experiment" shop, as he called it. But when those mysterious metallurgical experiments were crowned with success, and his employers asked for the results, for which they had expended their money, why, the old man was no fool. "He was on to his job." He had it all locked up here (tapping the top of his head), and there it was going to stay, and stay it did, for no one ever heard of him startling the world.

Naturally all this mystery excited the liveliest curiosity in the breasts of us youngsters, and we schemed to obtain possession of so carefully guarded a secret. Accordingly the writer quit pegging at the furnaceman, and labored assiduously to cultivate that worthy's friendship. This was not a difficult task as he was a good natured soul of a forgiving disposition. So when the thing was explained he was in it hand and glove. He wanted to know too. Had it not been for his oxenlike disposition, it would have been no trick for him to solve the problem himself. As it was he followed his instructions and little by little, as he had the chance, he weighed the mixtures, and this was the result: Soft brass (for general machinery fittings): Copper 86 per cent, tin 7 per cent, zinc 4 per cent, lead 2 per cent. There is a foot note to this in my notebook which says: Tested, this is excellent.

Hard brass (for bearings, etc.): Copper 86 per cent, tin 12 per cent, zinc ½ per cent, lead ½ per cent. Speaking of bearings reminds me that all the bearings we made in that shop, and we made great numbers, were cast with the bearing up.

Theoretically this is not good practice, as the bearing being the part that is particularly wanted sound, if cast uppermost, any dirt held in suspension in the metal will be found there because being lighter than the metal, it will rise to the highest part of the mold. This is the reason why it is the general American practice to cast them bearing down. In practice, however, brass castings are expected to turn out as sound on the top as on the bottom. In circular and other objects that are finished all over it would be a poor excuse if on turning up, one side was found dirty or porous, to say: Well, that is the side that was cast uppermost, and consequently the dirt in the metal had lodged there. It is not expected that there shall be any dirt in the metal, that enters the mold, as either the metal must be cleaned before it is poured, or the casting so gated that dirt cannot enter the same. Such being the case it should not make much difference which side

of a casting is cast uppermost, as both sides must be equally clean.

The practice of making the castings under consideration, with the bearing in the cope, has several good points, which are worthy of consideration, viz.: They are easier to mold, the shrinkage can be better controlled and they can be poured cooler and time and labor saved in chipping. They are easier molded because the entire pattern is in the nowel, which need be no deeper than will give a margin of safety against "run outs." The cope being comparatively low the shrinkage is better controlled because the castings are gated at the highest point, and the diameter of the sprue can be made sufficient to feed the same. We can therefore pour with the metal at a medium temperature as the sprue being filled last and being of sufficient size the metal remains liquid after the castings have begun to congeal, and, in so doing draws metal to supply the shrinkage from the liquid sprue. Now when we mold the bearing down the casting is entirely in the cope. The sprue leads the metal down to the joint of the mold, the castings are therefore run from the bottom, and the metal must rise up in the mold. In order to ensure the mold filling properly we require a high head to obtain the pressure requisite. We have consequently a high cope which is awkward to handle, the sand has to be nailed before drawing the pattern to prevent it dropping when closing. All this takes time, and if we pour cool we are likely to find deep shrinkage cracks in the back at the juncture of the flange and the body of the box. Therefore the metal must be poured at a lively temperature, and the casting comes out rougher and with more or less finn, which means so much extra work for the chippers.

But to return to our reminiscences, as I before mentioned, the foreman, in spite of his little peculiarities, was a good mechanic. He thoroughly knew his business. One could tell at a glance that his was a well-regulated shop. Everything was neat and trim, and in its place. The floor was swept and the flasks were neatly piled. Every bit of scrap was carefully looked after. Each molder had an old crucible standing at his bench, into which he threw his riddlings left in his sieve after screening the sand onto his patterns. At the end of the week these riddlings were sieved to separate the sand and the scrap washed and cleaned of iron, with a magnet, when it was ready for melting down. The ashes from the furnaces were saved, and about once a week taken to what might be called the salvage department, where the brass was extracted. The dry process of extraction was used, the ashes being ground to powder in a pug-mill and then screened. The amount of metal thus recovered was considerable. Much of it had the appearance of shot and was cleaned of iron, run into ingots and proportioned amongst the new metal.

Some Causes of Excessive Heating in Bearing Metals.

Robert Job, Chemist, Philadelphia & Reading Railway, in American Engineer and Railroad Journal.

It is a fact well known to those who have made a study of bearing metals that physical condition and structure exert a marked influence upon the efficiency of the metal in service. Formerly great stress was laid upon the chemical composition of the alloy, and comparatively little attention was paid to the effects of the different conditions of foundry practice, or to the relation between structure and efficiency. The natural results followed, and "hot-boxes" became prevalent in railway practice, especially so when weights and speeds became materially increased. Attention was thus directed to the production of cool-running and durable bearings.

As a result of carefully conducted service tests, the old copper-tin alloy of seven to one was found to be inferior as a bearing metal, and the copper-tin-lead composition was gradually introduced, at first combined with phosphorus, and later with this element present in very small amount, if at all, and then used only as a deoxidizing agent. The efficiency of a copper-tin-lead composition, other things being equal, was shown by Dr. Dudley to increase with the proportion of lead which was present, the amount being limited owing to inability to combine more than about fifteen per cent. with copper to form a homogeneous composition. A large excess of lead was also avoided owing to the necessity of maintaining a strength sufficient to support the load, and also a fairly high melting point in order to prevent fusion and running from the box if heating resulted.

During the past few years greatly in-

creased attention has been paid to the microscopic study of the metals, and the importance of this method of investigation is becoming clearly recognized in view of the results which are being obtained through its use. In the course of an investigation to determine the alloy most efficient for general railroad use, we found it desirable to follow up this structure of bearing metals in order to note the influence of this as well as that of the chemical composition upon durability in service.

In order to secure information, a large number of bearings which had run hot and had been removed from cars of different railroads while passing over the Philadelphia & Reading Railway were taken for test. Fractures were made to show the general physical character of the composition, sections for microscopic examination were removed, polished, etched, magnified as far as necessary to show the structure to best advantage, and photographed. Analyses were also carried on at the same time, especially in cases where marked segregation of the metal was found to exist, in order to determine whether this result was due simply to an attempt at the foundry to form an alloy in proportions which were physically impracticable, or whether it was merely an effect of improper foundry manipulation. The marked crystallization which was often found in these bearings was also investigated in a similar manner. Also, in the majority of cases test sections were cut from the bearings, and the tensile strength and elongation determined, in order to find out whether in a given composition proper foundry practice would not be insured by placing a minimum limit upon the strength and ductility of the alloy.

Side by side with these tests a considerable number of alloys have been prepared in the foundry to check the accuracy of the deductions, and to secure information as to the conditions of foundry practice necessary to give the greatest strength and ductility to the given composition.

By means of this study it has been possible to determine the causes of excessive heating in the large majority of the bearings examined, and we may summarize them as follows:

First, Segregation of the metals.

Second, Coarse crystalline structure.

Third, Dross or oxidation products, and an excessive amount of enclosed gas in the metal

In addition to these, the lack of proper lubrication might be mentioned, though our investigation seems to show that a relatively small percentage of the bearings examined had been discarded owing solely to this cause.

Segregation has been found to be due in many cases to an attempt to alloy the metals in improper proportions, this being notably the case in some of the copper-tin-lead compositions in which an excessive proportion of lead had been introduced, resulting in the liquidation not merely of a portion of the lead, but often also that of a part of the copper into "copper-spots," thereby producing surfaces of relatively high heating capacity, and ultimately causing "hot-boxes." Figure 3 represents a photomicrograph of a copper-tin-lead composition which had segregated owing to pouring too rapidly when at too high a temperature. In this case a portion of the lead had separated out, and also a slight crystallization is seen owing to the presence of slight excess of silicon in the metal. Figure 1 is a photograph showing upon one side the fracture of a badly segregated bearing with "copper-spots," and upon the other that of a well-mixed and homogeneous composition—the segregation in the one case being due partly to the presence of an excessive amount of lead in the brass, and partly to improper foundry practice.

To a certain extent, these segregations may be prevented in a wrongly proportioned composition simply by a rapid chilling of the metal immediately after pouring, as for instance by the use of a cold iron mold. Such practice, however, is at the expense of the ductility of the metal, and causes a marked increase in brittleness with consequent rapid wear in service. High heating combined with rapid pouring and feeding is also a frequent cause of segregation, since under such conditions of metal in the mold remains for a considerable time in a molten condition, and by chilling gradually is given the greatest possible chance to solidify in definite natural alloys, throwing out whatever excess of metal may be present beyond these proportions, and thus resulting in segregation.

In actual service, the effect of these segregations is readily understood, for it is evident that instead of an alloy of uniform

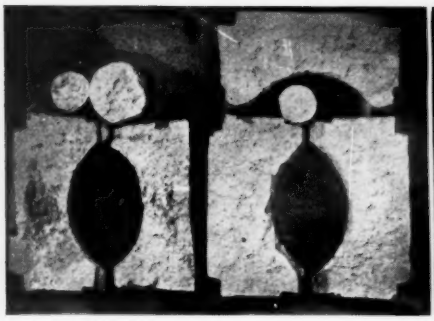


FIG. 1

FIG. 2

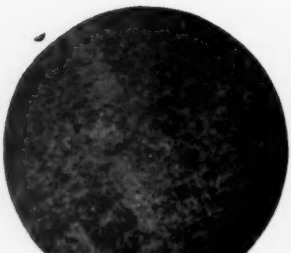


FIG. 3

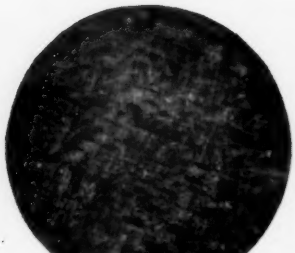


FIG. 4

FIG. 5

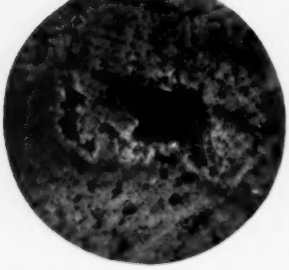


FIG. 6

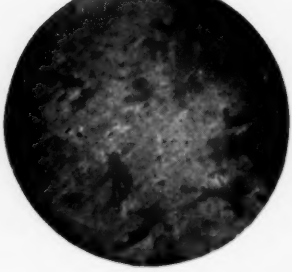


FIG. 7

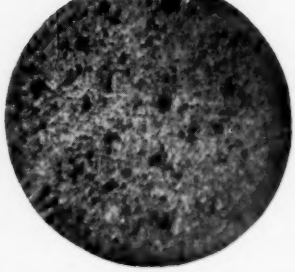


FIG. 8

FIG. 9

FIG. 10

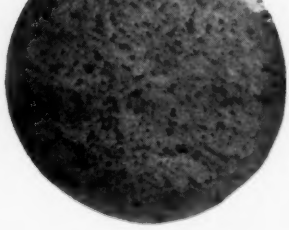


FIG. 11

hardness and heating capacity, there is a mixture, some portions of which are relatively very hard and others very soft, and this difference combined with that occasioned by the varying heating capacity of the different portions naturally localizes friction, and ultimately results in excessive heating. In a homogeneous alloy or composition no such conditions exist, and although, as is true of some compositions, some of the metals may be present, at least in part, in mere mechanical mixture and not as a definite alloy, yet the particles may be made so small by proper foundry practice that the friction throughout the bearing is practically uniform, and undue local heating is not liable to occur excepting through some outside agency.

The coarsely crystalline structure which was often seen in these defective bearings was in some cases found to be due to the composition of the alloy, antimony especially tending in this direction. In many cases, however, it has been traced to the foundry practice, often being due to rapid pouring at high temperature. Crystallization was also caused in some cases by the presence of an excess of various materials which were originally added as deoxidizing agents. Phosphorus and silicon are good examples. These, if added in suitable proportions, depending upon the condition of the metals, effect cleansing and free the metal from a large proportion of its enclosed gas, adding greatly to the fluidity, and thus rendering the casting less porous, and at the same time increasing strength and ductility often to a marked extent, correspondingly increasing the capacity for wear. Excess of these materials beyond the amount required for deoxidation appears not to be thrown off from the metal in the form of oxides very appreciably, but causes a crystallization which in a number of the bearings examined was so marked that it not only occasioned serious weakness and lack of ductility, but also such an increase in frictional qualities that cool running under the ordinary conditions of service was evidently an impossibility since the brasses had run hot and had been discarded from service shortly after the lead lining had been worn away. Figures 4 and 5 represent photomicrographs of two of these metals, and the structures show clearly the source of the heating.

One great advantage in the use of the microscope in connection with the deoxidation of these compositions lies in the fact that it becomes possible to tell quickly and with certainty the exact amount of the deoxidizer which is needed to combine with the oxygen present, without leaving more than a trace of the material behind in the finished casting to act as a weakener.

The effects of this coarse crystallization upon the durability of the bearing are twofold. In the first place, increased local heating results in the same manner as in the case of segregated bearings, owing to the varying degrees of hardness and heating capacity of the constituents, and secondly, the ductility of the metal and the tensile strength are materially decreased. As the rapidity of wear with a given strength has been proved repeatedly by different experimenters to increase with the brittleness, it thus becomes evident that the durability of one of these crystallized bearings in service is bound to be defective owing to an excessive rate of wear, even though the heating which would naturally result should not occur.

Figure 10 represents a segregated copper-tin alloy containing about 80 per cent of copper and about 0.1 per cent of phosphorus, showing the crystalline structure of such composition, and it may be mentioned in passing that the old copper-tin alloy of seven to one, having a somewhat similar structure, and formerly much used for bearing metal, is a notoriously rapidly heating composition, and is not often found to-day in railway practice. Figure 2 is a photograph of the fracture of one of these badly crystallized brasses together with one showing a homogeneous and fine-grained structure.

Another very common source of difficulty found in defective bearings was the presence of particles of dross or oxidized metal mechanically enclosed, and also of large amounts of occluded gas in the metal. In the former case a hard cutting surface was presented to the journal, causing increased friction and hence heating. The presence of occluded gas in excess also tended in the same direction by reducing the actual bearing surface of the brass, and thus materially increasing the pressure. Such metal was naturally found to be very brittle, and to have worn rapidly in service. In the foundry practice, the presence of this enclosed matter is as injurious as in the bearings themselves, tending to cause sluggish pouring, unless the metal is heated to a very high temperature, in which case crystallization and segregation—as shown above—are

liable to result unless the speed of pouring is very carefully regulated.

Figures 6 and 7 represent dross mechanically enclosed in a copper-tin-lead composition, and Figures 8 and 9 show the appearance of the metal when containing an excess of occluded gas, and show clearly the loss of bearing surface which may result from such porous condition.

The presence of dross enclosed in a bearing is simply a proof of carelessness in the foundry and is due either to defective skimming or to pouring from the bottom of the pot. In either case proper oversight will prevent the difficulty. An excess of enclosed gas, on the other hand, is ordinarily due to lack of proper deoxidation of the metals, though at times it is also caused by pouring at too low a temperature. Thus it indicates not necessarily carelessness, but rather a lack of knowledge upon the part of the foundryman of efficient foundry methods.

Figure 11 represents the structure of a copper-tin-lead composition, close-grained and homogeneous, showing only a slight crystallization, the brass having been deoxidized with a slight excess of phosphorus.

Turning now to the influence of the above-mentioned defects upon the tensile strength and elongation of the bearings examined, in every instance we have found the result which would be expected. The presence of dross or any foreign matter in the metal introduces an element of weakness, and thus reduces both the tensile strength and the elongation. Coarse crystallization produces the same result, the faces of the crystals forming the surface of least resistance, and thus facilitating fracture, and diminishing ductility. A test section taken from the bearing represented by Figure 5 showed a tensile strength of 10,500 pounds per square inch with an elongation of only 4 per cent in a 2-inch section. A bearing of the same composition if properly prepared in the foundry and free from crystallization would have a tensile strength of about 25,000 pounds per square inch and an elongation of about 13 per cent when the test sections were taken from the bearing in a similar manner.

In the porous brasses we naturally found the same lack of strength and ductility owing to the deficiency in the amount of the metal present in a given section. For example, the bearing represented by Figure 8 showed a tensile strength of 15,000 pounds per square inch with an elongation of only 6 per cent. Figure 9 showed a tensile strength of 18,700 pounds per square inch with 7 per cent elongation. Thus, we see that the influence of the various defects is clearly shown when metal of a known composition is subjected to the tensile tests, and it becomes possible to hold the foundry up to a high grade of excellence by means of these comparatively simple tests, with analytical and microscopic work as a basis.

Objection may perhaps be made that it appears rather arbitrary to place limits upon tensile strength and elongation in bearings, and that after all in practical service it is merely necessary to have, with a proper composition, a fairly strong homogeneous material to obtain good results. In reply we will merely state that as a result of very carefully conducted service tests made by placing bearings of practically the same composition, but differing widely in both tensile strength and elongation upon opposite ends of the same axels, we have invariably found that an increase of strength and ductility meant an increased life to the bearing in service and a lessening of wear, our results in this respect being in accordance with the deductions given by Dr. Dudley in 1892 before the Franklin Institute. As an instance of difference in efficiency due to these causes, we may cite a service test in which eight bearings each, of two copper-tin-lead compositions, were placed under tenders of fast passenger locomotives, one bearing of each kind being placed upon an end of each axle. All of the bearings were of practically the same composition, but the one set showed a tensile strength of about 16,500 pounds per square inch with an elongation of about 6 per cent, while the other had a strength of about 24,000 pounds per square inch with an elongation of about 13 per cent. This marked difference was due simply to the fact that in the one case the metal was porous, about as shown in Figure 8, while the other was thoroughly deoxidized, and was closely grained and homogeneous, somewhat similar in structure to Figure 11. From time to time these bearings were removed and weighed, and the end-wear measured. As a final average result it was found that the more brittle set had worn 35 per cent more rapidly than the other set. The results of similar tests also have been in line with these results. There-

fore it becomes evident that increased ductility and strength in the bearing of given composition means, as stated, an increased life for the bearings in service, and as this increased ductility necessitates also freedom from the defects which we have mentioned above, it is evident that the chances of cool-running are proportionately increased. These qualities are therefore not merely of theoretical interest, but have also an intensely practical value, and have a marked influence upon the success and economy of railway service.

Regarding the preparation of the sections for microscopic study, we have found it desirable to cut them from the center of the bearing, filing and polishing after the usual methods, and finally etching with an approximately deci-normal solution of iodin in potassium iodide—the time of etching being usually about one minute. This etching gives very satisfactory results in many cases, although in some cases etching with dilute nitric or with dilute chromic acid has shown the structure to better advantage. In this much depends upon the information desired. In ordinary work we have found that magnification to about thirty diameters is sufficient to show the general structure to good advantage.

In connection with our work it is clearly indicated that too much stress can hardly be laid upon the importance of the microscopic study of these alloys owing to the definite knowledge which is given regarding not only the composition of the alloy, but the general physical structure, the presence or absence of friction producing agencies, and owing also to the check which is given over routine foundry practice.

Melting Cast Iron Turnings and Borings.

BY EDWARD KIRK.

Many tons of cast iron, turnings, planings and borings are made by machine shops in finishing castings. The market value of this iron, when new and clean, is only about one-fourth that of foundry iron from which it was made, and is not always salable even at this low price, in many sections of the country.

Founders having machine shops in connection with their foundries have reasoned that this iron came from soft castings and was therefore a soft iron, and available for melting and running into soft castings again. Many attempts have been made and plans devised for utilizing it in this way, all of which have proven a failure to a greater or less extent, so far as obtaining a satisfactory soft casting from it was concerned.

Fine iron filings may be burned in a flame of a candle and nothing but a black oxide of iron left. When this iron is charged into a cupola in small quantities through a heat, it is probably all converted into an oxide, and consumed in the cupola; as no bad effect from it upon castings has been noticed, when melted in this way, and probably no iron is obtained from it. The oxidizing action of the blast upon the small particles of this iron is so great that it can only be melted in a considerable body, and even then, the iron obtained from it is white and only suitable for weights or work requiring such an iron. With a view of utilizing the iron for warming ladles and preparing it for future use, it has been charged upon the bed and poured into pigs after warming the ladles, but it was found, the quality of iron was not improved by running it into pig and melting of the heat was greatly retarded by placing it on the bed.

When charged at the end of a heat with a view of running it into pig, very little iron is obtained, and the greater part of the turnings, etc., are found in a more or less oxidized condition in the slag and cinder, adhering to the lining or in the dump.

To prevent oxidation of this iron in melting, it has been tightly rammed into cast iron pots, closed with a cast iron cover and luted to exclude the cupola blast, and melted alone, and also with other iron. This plan proved a failure, as it was found the quality of iron obtained was not improved to a sufficient extent to justify the expense of the pots and labor in preparing them.

A number of plans have been devised to form this iron into a solid mass in pots, and also in molds without pots, by adding to it some material to make it stick together, when rammed into a solid mass. For this purpose, salamoniac water, molasses water, etc., have been used and the iron left for a few days, after being rammed into a pig mold or other device, to rust into a solid mass before melting.

This plan worked very nicely so far as forming the iron into a solid mass was concerned, but it was found when melted that the iron was not softened by preparing it in this way for melting.

Of all the plans devised for melting this iron in a cupola, probably the best one yet found is, to place it in tight wooden boxes holding from 100 to 200 lbs. By this plan, it is held together until it reaches the melting zone, where the boxes are consumed, leaving the iron in a compact mass to be melted. In this way an entire heat may be melted by placing the boxes in the cupola, a little distance apart, and putting coke between them, to keep the cupola working open and free. By this means, the oxidizing effect of the blast is reduced to a considerable extent, and a larger per cent of iron obtained than when thrown in loose. But oxidation is not reduced to a sufficient extent to admit of a soft iron being obtained, and the iron melted is always white and hard. This fact should be remembered when melting this iron with other irons, as the resultant mixture is similar to that produced when melting hard pig or scrap with soft pig. If the cupola is tapped close and iron drawn into small ladles, soft iron may be poured from one ladle while hard iron may be poured from another.

The melting of this iron in boxes, in a heat with other iron, in the proportion of 5 to 10 per cent, has been known to give satisfactory results in heavy work, for which the iron was drawn in ladles holding a number of tons, and the iron given an opportunity to enter into combination with the soft iron in the ladle, before pouring.

But, even when treated in this way, and poured into a heavy casting, it has in some instances been found to not thoroughly unite with other iron, and to produce hard spots in the casting, and also excessive shrinkage in parts of the casting; sometimes causing it to crack at a point least expected, and at which the least strain on the casting should have taken place.

The uncertainty of results of melting this iron with other iron, either for light or heavy castings, are so great, that I have never known of a founder continuing to melt it, after he had experimented with it a sufficient length of time to learn of its fallacies. The melting of this iron in ladles has also been tried, but results have generally been unsatisfactory, as only a limited amount of it can be melted in this way even when the iron is very hot, and when not very hot it may be carried into a casting, unmelted with the iron, causing hard spots.

This may occur when the fine iron is thrown into the molten iron with the hand in small quantities. When placed in the molten iron from a shovel in quantities, it balls up and melts very slowly. When placed in the ladle before tapping, it forms into a solid mass in the bottom of the ladle and a layer of one inch in thickness may not be melted during an entire heat. It also causes small blow holes in castings when placed in molten iron.

In sections of the country where there is no market for this iron, it may be used for side walks, yard gangways, scrap heap floors, etc. When used for this purpose a foundation of from 10 to 12 inches of ashes or cinder should be put down to prevent its being affected by frost. The iron, when clean and free from rust, should be thoroughly wet with a strong solution of sal amoniac and placed upon the ash bed three to four inches in thickness, even rammed down and left for a few days to dry before using. In a short time, the iron will be found to have rusted into a solid plate of iron.

When the turnings are heavily coated with rust, they will not form a solid mass, when treated in this way, and should be mixed with a thin cement, which will hold them in a solid mass and make an excellent walk or floor.

Milwaukee Coremakers' Agreement.

At a recent conference between the foundrymen of Milwaukee and the coremakers of that city the following agreement was reached:

"1. On and after March 1, 1900, the minimum wages for skilled machinery core makers shall be 25 cents per hour. 2. Core makers now receiving more than twenty-five cents (25c) per hour shall not be reduced. 3. All over-time, over ten hours' work per day, excepting when from accident or other cause beyond control, and not consuming more than 30 minutes, shall be paid for time and one-half. 4. A core maker entitled to receive the minimum wages must be thoroughly competent to make any core that is used in castings; able to properly mix the sand, ram and rod his cores, know when they are properly baked, and that they are complete, properly fitted, safe cores, ready for the mold. 5. The foreman or superintendent of the foundry is to be the judge as to the ability and skill of the core maker, as to whether he is entitled to receive the minimum wages. 6.

It is understood that there is nothing in this agreement that will prevent the employment of other workmen and boys to make such cores as they may be competent to make at a lower rate of wages. 7. Foreman core makers shall not be members of the core makers' union. 8. This agreement to continue and to be in force until Jan. 1, 1901, and unless 30 days previous thereto notice of a desire to change any of the conditions of this agreement be given by either party thereto, then this agreement to continue and be in force until Jan. 1, 1902. The above parties hereto pledge their best efforts to carry out this agreement in good faith with the understanding that during its life no further demands be made by either party on the other."

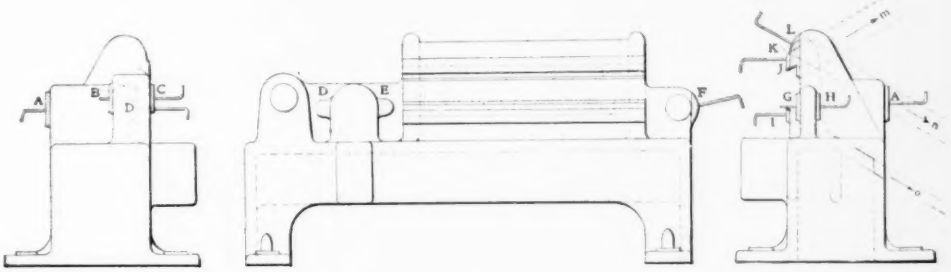


Fig. 1

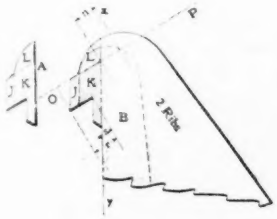


Fig. 2

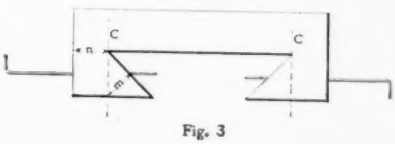


Fig. 3

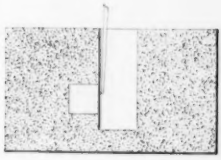


Fig. 4

Pattern Making—Using Loose Pieces Instead of a Core.

The pattern shown in Fig. 1 is made entirely without core print or core box, and it shows how loose pieces can sometimes be brought into play to advantage. It represents the bed piece for a certain small machine for special work, its total length being only 14¾ inches, and it was not intended for a permanent, or standard, pattern.

Usually bevel guides like those shown would be cored out; but in this case the inside of the pattern was coped, and if a core print had been added to the outside it would have had to come even with the edge that was coped, and so it would have been an awkward core box to make, fitting around, as it would, the side of the piece. Besides, when one part of a flat surface is made by the mold and the rest is formed by a core the casting hardly ever has the two surfaces exactly to match, and even when they do come together nicely, the part made by the core has a different appearance. Notwithstanding all this, it would doubtless have been easier for the molder if a core had been used in the present instance, but for one casting it would take less time for him to remove the loose pieces than it would the pattern maker to make a core box.

Fig. 1 shows three views of the pattern, with the various loose pieces wired in position. The round bosses A, B, C, G, H and the ears D, E and F need no description, as they are simply picked back into a generous space after the pattern is removed.

The loose parts I, J, K, L of the guides are started back in the direction of the parallel dotted lines and arrows in the end view, and here the space becomes more limited, so it might be well to dwell for a few minutes on the subject of loose pieces in narrow quarters.

Take first the simplest possible example, shown in Fig. 3. The two triangular pieces inside the lines C, D on each side are supposed to be wired to the main part of the pattern, and when it is withdrawn these

pieces are left behind. Referring again to the figure, it may look as though there was not room enough to extract the pieces, but as long as the distance m does not exceed the length n the part can be easily removed, for the instant it is started all is free, and it can be drawn up through the opening n without difficulty.

In doubtful cases the simplest plan is to make a line on the drawing, as at C, D, so as to divide the loose piece from the main pattern, and then place over it a piece of thin paper and trace the outline of this part. Next cut the paper to the lines, and see if, when it is placed over the drawing again, it can be moved between the lines which would represent the sides of the mold.

When a loose piece is drawn from a mold, as in Fig. 4, where it must come steadily in one direction until it is entirely free and with no chance for rolling or tipping it, we must remember that the pointed wire the molder inserts in the piece is taking up part of the cavity through which the piece must come, so that allowance must be made for this wire also.

Now, to return to the original subject and examine the pattern we started with, we find the quarters rather close in which to remove the upper part of the guide, shown better in Fig. 2. Everything to the left of the line x y must be loose and come out through the cavity made by the solid part of pattern B, with its two ribs. Let us make a paper templet A, as before described. It is evident at the outset that the part A cannot be withdrawn in one piece, so we will cut off the part L and note the result. The piece must be slid back in the direction O P a distance equal to r, but as the length is greater than n it will strike, so we will next cut off the part J. The remaining piece K must now slide back in the same direction as before a distance equal to s, but as this is less than n all is now clear, and K can be withdrawn easily, and then L and J. The loose piece I in the lower part of the guide in Fig. 1 comes readily, as there is ample room for it.—John M. Richardson in American Machinist.

Profit Sharing.

The Haydenville Company, of Haydenville, Mass., under date of February 27 issued the following notice to its employes:

"From the first the plan of the organizers of The Haydenville Company has been to get the employes interested as profit sharers in the company and for this purpose stock was offered at time of organization to all who wished to subscribe. We are pleased to state that many embraced the opportunity; others expressed willingness, but had not the ready means to carry out their wishes.

"The officers in the first few months of business realized that the steady and faithful work on the part of the employes was contributing in quite a degree to the success of the company, and plans were early considered looking toward the payment to them of some share of the profits. Many methods were discussed but none seemed so equitable and fair as the following one, which was passed unanimously at the recent annual meeting:

"'Resolved: Whereas the Board of Directors desiring to give expression and substantial recognition of their appreciation of the loyalty and co-operation of its employes (not including officers) in a manner other than by a formal vote of thanks, hereby directs that there be paid to each and every person now in its employ a sum in cash representing one (1) per cent. of the total amount of wages such employes have been paid from July 1st, 1899, to January 1st, 1900, such payment to be made March 1st.'

"This is prompt recognition of our appreciation of your services, and while not a large dividend on your labor, we hope by another six months to increase the percentage.

"We want you to feel that our success is your success; with all in this frame of mind no time will be wasted, no work slighted or duty shirked and a larger output produced at less expense and of a better quality, enabling us to command the markets for and maintain the reputation of 'Haydenville Goods.' The result will be larger business, steady employment, uniform wages, and increased prosperity to all.

"While the management are aware that there are some of the employes who are undeserving this substantial recognition, and who are careless and indifferent to the company's success, yet we do not deem it just to ignore any, and we give these extra sums crediting all with a sense of honor, and feeling confident that new endeavors will be made and an increased zeal manifested. There are many reforms still to be made,

and when proposed we hope to receive as in the past your continued support and co-operation.

"Respectfully,

"C. J. HILLS, President.

"C. K. SANBORN, Vice-President.

"A. S. HILLS, Treas. and Sec'y."

A Talk that is Not so Plain.

BY JAMES HERENDEEN.

I have come across a small book called "Plain Talk With Foundrymen," of which one J. F. Boynton acknowledges the parentage. In the introductory remarks the author says:

The writer of this book does not sign his name with an M. E. appendage, has never delivered lectures or read valuable papers before any scientific body of men, is not a chemist, nor yet a metallurgist, was never consulting authority to any college or institute, but is a thoroughly up-to-date mechanic, with over twenty-five years' experience in the iron industry, beginning in the core room at the age of fourteen and finishing as factory superintendent at the age of forty.

This volume is not intended as a literary effort in any way whatever. It is compiled from statistical authorities, rudimentary knowledge of chemistry, with a life study of factory economics, and close observation.

One year of actual shop practice is worth more than ten years of book instruction.

This work is available to employee as well as employer, and may be readily understood without resorting to or consulting with scientists, chemists or metallurgical experts.

The fact that the author does not sign his name with an "M. E." appendage, is probably because he is not entitled to do so. That he has never delivered lectures or read valuable papers may be due either to inability or bashfulness. How a man unacquainted with either chemistry or metallurgy could command sufficient nerve to compile a "Plain Talk to Foundrymen" from statistical authorities, rudimentary knowledge of chemistry and a life study of factory economics is somewhat beyond my range of imagination.

The closing paragraph of Mr. Boynton's introduction to his "Plain Talk" would tend to leave the impression that anyone could start a malleable foundry simply by reading that book. Such is far from the being the case, however.

In order that the reader may not be deprived of the solid chunks of wisdom falling from Mr. Boynton's intellect, I append his "Plain Talk" as far as it has anything to do with the foundry business:

There is little doubt that the production of malleable iron in its primitive stage, preceded that of common gray iron. It is a historical fact that the Hindu, the Burmese, and even the natives of Borneo and Madigascar and certain portions of Africa, manufactured a charcoal iron, in itself semi-malleable, from which they in turn made cooking utensils and weapons of warfare, which was capable of being tempered. This would lead us to reasonably suppose that they at some period in this process produced an article which in some respects resembled our mild steel of the present day.

The only reason given for their arriving at such a fine grain or grade of metal from the direct process is that the ores found at that period and locality were nearly, if not quite, pure metallic iron, and they were but little troubled with the modern founder's pest that is ever with us, i. e., sulphur and phosphorus. We imagine that were these primitive iron masters engaged in foundry practice in these hurly-burly closing years of the 19th century they would have to use something besides a pit and hand bellows to keep in line.

The malleable casting of the present day is, practically speaking, to all intents and purposes, an American product, and its uses are now too well understood to require further comment.

The word malleable means that which may be drawn out extensively by heating—capable of being extended under the hammer. Malleable iron means cast iron, which, by a process hereafter described, is deprived of its carbon and thus freed from its brittleness. Malleability means the quality of a body which renders it susceptible to extension by beating or bending.

Twenty years ago the modern air furnace or reverberatory, was in its infancy, and those that were then in use did not much resemble those in use at the present day. There has been text books on iron and brass founding, chemical treatise on the manufacture of iron and steel and statistical authorities compiled without number, and all ably written by eminent metallurgists and scientific authorities, and are of great value and available to all who may be and are, no doubt, enjoying the experiences and results so faithfully portrayed in those works.

But we have yet to see the first malleable cast iron treatise, due doubtless to trade secrets, or in other words, a system which has been adopted in all the larger and more successful malleable plants of instituting a rigid system of surveillance of all parties not immediately or actively employed by the company, excluding all reporters and newspaper men from their plant. The knowledge, when once acquired by the operator, he knowing its

mercantile value, would, of course, just as closely guard the same as his employer, and were he to change shops he would never divulge his particular analysis or mixture, knowing that on this and this only, depended his salary, hence the great secrecy prevailing at this writing regarding this form of iron manufacture.

The art of mixing raw brands of pig iron and steel scrap by analysis, the construction and operation of the air furnace and annealing oven, have always been and are now jealously guarded. In fact I recall the time, only a few years since, when a certain malleable foundryman in the state of Ohio exacted and actually received $500 for a set of blue prints of an air furnace. But the time is past and gone when the few can successfully mislead the many.

The true secret of the malleable business is the mixture, and that is universally controlled in all well regulated up-to-date malleable foundries by chemical analysis furnished by the chemical expert immediately in charge of the blast furnace where the raw pig is produced. When it is understood that the quality of the output of our principal malleable foundries is regulated by these gentlemen, it goes without saying that in order to retain their custom and give satisfactory results, the proprietors of the blast furnaces will spare neither pains nor money to secure as a chemist to their works the very best talent to be found in the profession. He must be a thorough metallurgical chemist, not one of our agricultured would-be's.

Certified analyses of all irons produced by these blast furnaces are available to any purchaser from the company, but the important question is how to grade and mix from two or more analyses submitted from different furnaces and by different men from different localities. This is a point to arrive at which requires years of actual practice and an accurate system of tabling experiments.

Analysis for good malleable mixture where no scrap is used:

	No. 1	No. 2.	No. 3.	No. 4.
Carbon	3.40	2.88	3.07	3.03
Silicon	1.36	1.09	1.04	.83
Sulphur ..	.07	.08	.03	.04
Phosphorus	.29	.38	.43	.31
Manganese,	.28	.66	.96	.27

The superiority of air furnace iron over the cupola product is too well known to be questioned, and is evidenced by the gradual disappearance of the latter as a means of making malleable castings and its replacement by the air furnace.

In the treatment of pig iron in the air furnace great care should be taken in the selection of the man who grades and charges. He should be steady, sober and of excellent judgment, of fair education, and above all, perfectly reliable in his statements and figures.

A modern air furnace should occupy an immediate ground space of 20 feet long, 8 feet wide and 4 feet high. They are usually built of select brands of fire-brick with tap and peep-hole and charging bung at the top incased in cast iron plates, bolted or backstays at the corners and cross ties in the center with overhead portable arches, and cost complete with 50-foot brick stack, from $2,800 to $3,000.

The fire box should be built with the regulation grate bars and bridge walls, say 4x6; bridge wall must be built hollow to avoid cracking and should be about 16 inches high, extending the entire width of the fire box.

Beginning immediately at the opposite side of the bridge wall from the fire box the brick base of flooring of the furnace commences and slopes gradually downward, its lowest point being about the center of the furnace; lengthwise from this point on toward the flue the brick flooring makes a gradual rise until it reaches a corresponding level at the base of the bridge wall at the other end of the furnace.

A close observation of this description will readily show a depression or reservoir in the center of the furnace, which is intended to hold the molten metal. At the center and bottom of this depression is the tap hole, and arranged alongside is the operator's peep hole; about 12 inches to the right and top comes the slag hole.

The flue should, I think, always be constructed of brick, although many shops erect a sheet-steel shell similar to a cupola shell, and line this with brick, but for durability, good draught and sightly appearance give me the brick stack complete.

Immediately over the bridge wall dry blast is introduced, the tuyeres being placed in the roof and top of the furnace upon a slant toward the stack sufficiently to drive the blaze coming up over the bridge wall down toward the reservoir, where the raw material is charged. The top of the furnace can be made by using arched brick stays, with flanges at lower side for holding brick. These arched sections are bolted together and admit the length of common fire brick.

As these arched sections are placed, each alternate side should receive a coating of prepared mud or furnace dressing, and the next section placed snugly against the first and so on until your roof is complete. The charging hole, or bung, should be about two feet toward the bridge wall from the tap hole, and should have a cover constructed much the same as the roof sections.

This charging hole is served by a 15-foot jib steel crane of, say, five tons capacity.

Analysis of fire brick and ganister:

Silica	62.10	97.5
Aluminum	33.10	1.4
Ferro Oxide	3.00	.55
Lime	.90	.15
Manganese	Trace	.10

Assuming that the furnace is newly lined or rebuilt, the first thing to be done is to start a slow fire and gradually increase same. Keep this heat up for four or five hours, this will give the brick-work opportunity to thoroughly dry before subjecting the furnace to the severe heat necessary for business.

After the operator has selected his mixture he should charge the material through the bung, laying the stock along the floor upon the front slope; the scrap can be charged at the same time. The bung should then be replaced and any crevices or openings around the charging hole or between the roofing sections, should be closed with clay. Now raise your fire with all possible haste, and with a first-class fireman, endeavor to burn the largest amount of bituminous coal in the shortest possible time. Cheap and inferior grades of coal have been used in this process, also gas, crude petroleum and electricity, but I write of only that with which I am familiar, and can only recommend the very best block bituminous coal, such as Brazil. I do not question the efficiency of oil-gas or electricity, but merely state the fact that I am not familiar with these elements as a fuel.

The gases as they escape from the fire on the grate bars are met at the top of bridge wall by the dry blast before mentioned, which is introduced at that point, and creating complete combustion, thus eliminating any and all detrimental elements usually found in fuel, and allows the clear, pure flame to descend upon the body to be melted free from sulphur and phosphorus, and devoid of carboniferous gases, so sure to be met with in the old-fashioned direct or cupola process.

From his peep hole in the side of the furnace the operator can watch the fusing process, and when all is melted the mixture of two or three brands of forge pig, together with two or three kinds of scrap, lies in a melted state in the bottom of the reservoir. All the different brands are herein assembled in a melted state. All of this heat will be uniform, as the iron is all melted and resting in a body at the tap hole before the molders are called up and the furnace tapped.

This system is what is called melting by indirect contact, hence the splendid results obtained in the malleable casting business.

The use of steel scrap (old rails) in the manufacture of malleable iron has met with splendid results. A very satisfactory mixture, and one that will, I think, fill the bill, may be arrived at by using the following:

No. 2 forge pig.....25 per cent
No. 4 forge pig.....20 per cent
Steel rail scrap.....55 per cent

Regarding the above mixture there is a certain man now superintending a malleable plant in Chicago who draws a salary of $10 per day for his services, principally for his expert mode of manipulating steel scrap in the air furnace. He has little or no knowledge of molding, understands nothing about chemistry, can barely read or write, has a very poor executive ability, is not posted as to annealing, but is a good mixer of iron in the air furnace. I don't believe he could read a blue print of his own furnace if he saw it, all of which goes to show that the best mechanic does not always make the best foreman.

ANNEALING.

Anneal means to kindle, to inflame, to heat or bake. Annealed means heated, tempered, made malleable or less brittle through heat.

Annealing means the process of applying heat for removing carbon and other detrimental elements and rendering the body ductile.

A properly constructed annealing oven requires ground space of, say, 12x18x8 feet. The walls are built double of select fire brick. The roof is arched, the floor interlaced or honeycombed with transverse flues underneath, and by indirect system connecting with the main flue or stack, which is commonly constructed of sheet steel shell, which is in turn also lined with brick.

Two ovens may be connected with one stack. The latter should be not less than 50 feet high and of diameter to suit capacity of ovens. The ovens herein described have a receiving capacity of from three to five tons implement castings and ten to twelve tons railway work.

Malleable castings as they are taken from the molds to their first rattling, are as brittle as glass, and in the handling of fine intricate work great care must be taken to avoid breakage. If you will examine the fracture of a malleable piece before it enters the annealing room you will find a very high crystalized grade of iron. Examine it when it returns from the annealing room, the fracture will show a dark fibrous center somewhat elongated as to grain with a thin white scale surrounding the entire casting.

Malleable castings are milled immediately after they come from the sand, much the same as gray iron work; thence they pass on to the annealing room to be carefully packed in square iron frames or boxes which are called annealing pots. These frames, or pots, have no top or bottom but are nearly square frames usually about 22x16x8.

In packing the castings the first section of the frame is placed upon detached iron slabs with projections upon the bottom to serve as feet and also to enable the workmen to move them with ease. The operation of packing the castings in these square receptacles consists as follows: Secure a quantity of steel scales, which can be had at any rolling mill, spread upon an especially built flooring, sprinkle thoroughly with water diluted with salammoniac or muriatic acid, after which keep the mass constantly in motion, turning over and over with shovel until the salammoniac water creates the desired red or oxidized hue.

When this scale is thoroughly dry and ready for use it will show dark reddish color. The first section of the pot is now placed upon the detached iron slab, next spread the prepared scale over and completely covering the bottom about one inch deep, then a layer of castings, then more scale. Exercise caution in packing these castings; they must be skillfully and securely placed, being sure that each and every piece is entirely surrounded with a quantity of scale; castings of a uniform size should be placed together as much as practicable. The pots containing the heavier work should always be placed in center of oven which is, or ought to be, the point where greatest degree of heat will be obtained. Each fresh layer of castings must be packed precisely as those previously, and when section of pot is full place another section thereon, close the crevice or opening between sections with clay and proceed with the packing as before. As many sections may be placed together as the roof of the oven will allow. When completed cover nicely with the scale, and over all spread a thick coating of clay, thus rendering the operation airtight.

A number of these sectionally built pots may be arranged side by side in the oven, leaving, say, 8-inch space. The oven now being full, close the door, which is of the hoisting kind and built of fire brick board with a framework of iron, seal up the openings with clay, start your fire; raise the temperature gradually. In about 24 hours it has attained a very bright if not almost white heat, which must be maintained from two to five days (of 24 hours), owing to size and weight of castings and quality or depth of decarbonization desired.

The strength or malleability increases with the length of exposure in the oven to the heat up to a certain period which must be learned or acquired by practice, as all ovens do not burn alike, consequently the time required to anneal a casting in one oven would not be an accurate criterion to gauge another by. The chemical change takes place much more rapid in earlier stage of the heat than the latter, when the changing from white iron into malleable proceeds more slowly. In all cases the softening is more successful with small castings than larger ones.

After necessary exposure to the oven's heat as noted above, the fire is drawn from the grates and the oven is allowed to cool slowly. The door is then hoisted and more time is given for cooling. The pots are then withdrawn, dumped upon the iron floor and still further allowed to cool. When properly annealed the castings should present brilliant colorings with all the different hues of the rainbow; they are again returned to the tumbling room and placed in the rattlers a second time to remove adhering scale and polish them ready for shipment.

Touching briefly on some of the points brought out by Mr. Boynton, it appears to me rather doubtful if malleable plants exclude reporters and newspaper men from their works. Certain it is that these would not give any information away. While it is true that many people guard their knowledge of the malleable iron business, still it is their right to do so, and the same thing is done in any other trade. It is to be noted in this connection that even Mr. Boynton, with all his liberality, does not give anything away. No one could mix a heat of malleable iron after reading his "Plain Talk," nor would anyone be likely to construct a proper air furnace from the "Plain Talk" he has done on the subject.

More than half of the space in Mr. Boynton's "Plain Talk" book is given over to a lot of stuff which he has evidently induced "statistical authorities" to part with. This includes the old chestnutty rules for obtaining the weight of balls, hollow and solid, when not one foundry in a thousand is making balls, and if they were, likely enough they would see that they had iron enough in the ladle before they started to pour such a casting and then weigh it afterwards. Some rules for removing rust are also quoted of which the author himself should take advantage. A chapter called "Hints on Belting Pulleys" completes what is probably the queerest "Talk" to foundrymen ever put out in book form.

Among the Foundries.

The Sinking Spring (Pa.) Foundry Co. has been organized.

The Dodge Mfg. Co., of Mishawaka, Ind., will build a new foundry.

The Riverside (Cal.) Iron Works has been purchased by J. L. Rodgers.

The Buchanan Foundry Co., Ltd., has begun operations at Lebanon, Pa.

The Detroit (Mich.) Iron Mfg. Co. will build a foundry 60x100 feet in size.

The Weber Gas Engine Co., of Kansas City, Mo., is building a new foundry.

John Westwick & Son, of Galena, Ill., are erecting an addition to their foundry.

The Straight Line Engine Co., of Syracuse, N. Y., will erect a new foundry 88x160 feet.

The Price & Evans Mfg. Co., of Chattanooga, Tenn., have built an addition to their foundry.

The Hart-Parr Co., of Madison, Wis., is erecting a new foundry to supply itself with castings.

Chas. Hartwick has purchased the foundry at Hadley, Mich., hitherto operated by W. H. Johnson.

The Morris Machine Works, of Baldwinsville, N. Y., are reported as intending to erect a new foundry.

Hughes & Hummer, proprietors of the Winnebago (Minn.) City Foundry, will erect a new addition to their plant.

Frank W. Tilden has purchased the Eagle Iron Foundry at Hinsdale, N. H., formerly operated by Merriman & Tilden.

The Arthur Fritsch Foundry & Machine Co., of St. Louis, Mo., has increased its capital stock from $14,000 to $24,000.

The Chicago Foundry & Machine Co. has been incorporated at Chicago by Thomas Koser, Garrett Dykuizan and John Wain.

The new owners of the Eagle Furnace at Spring Valley, Wis., are making repairs on same, and will also build a small foundry.

The Central Foundry Co., operating the plant of the Bell Mfg. Co., at Vincennes, Ind., will double the capacity of that plant.

W. J. Duncan, J. W. Stribling and W. O. Hamilton are interested in a new foundry and machine shop to be erected at Seneca, S. C.

The E. W. Bliss Co., of Brooklyn, N. Y., has had plans prepared for new buildings including a foundry of greatly increased capacity.

H. C. Johnston, C. R. Comer and T. E. Bradbury have purchased the Gallipolis Foundry & Machine Company's plant, at Gallipolis, Ohio.

The Maud S. Windmill & Pump Co., of Lansing, Mich., will erect a new foundry 40x100 feet to replace the building burned some time ago.

Long Bros. have purchased a foundry at Napoleon, Ohio, and will erect new shops for the manufacture of pumps and brick-making machinery.

The E. C. Wehrfritz Foundry & Machine Company, of Little Rock, Ark., has filed a certificate decreasing their capital stock from $25,000 to $10,000.

Albin A. Hadling and Ernest Meckel have leased the Valley Foundry at Easthampton, Mass., and will operate same under the name of the Easthampton Foundry Co.

C. E. Traves, of Fresno, Cal., has purchased the foundry and machinery of the Hopkins Agricultural Works, at that place, and will add the same to his own plant.

The Chattanooga (Tenn.) Steel Roofing Co., which some time ago purchased the Kuhns foundry, is preparing plans for a set of new factory buildings, including a foundry.

The Anderson (Ind.) Foundry & Machine Co. has purchased of H. M. Gilchrist, of Indianapolis, the plant of the Ellwood (Ind.) Iron Company, and will place same in immediate operation.

The Hennessy Foundry Company has been incorporated at Springfield, Ohio, with a capital of $10,000, by William H. Garrett, Steven Luddy, H. P. Hennessy, Maurice Tehan and James Hennessy.

The Velte Foundry & Machine Co. has been incorporated at Pittsburg, Pa., with a capital of $60,000 by R. Osterman, A. C. Robertson, both of Pittsburg; T. Kirkpatrick, of Allegheny; E. E. Jones, of Wilkinsburg; A. L. Over, of Haysville.

The Chicago Hardware Foundry Co., North Chicago, Ill., has begun work on the foundation for another new building which will be used as a brass foundry. The company is also making extensive improvements in other parts of the plant.

The Pass City Foundry & Machine Co., El Paso, Texas, has been purchased by the Creel interests of Chihuahua, Mexico, and it is the intention to double present capacity and improve the plant at a cost of $15,000; boilers, engines, etc., will be manufactured.

Incorporation papers have been filed by the Gordon Foundry & Machine Company, of St. Joseph, Mo., with a capital stock of $27,000. The company will succeed to the business of the late Diehen Foundry & Manufacturing Company. The shareholders of the new company are William H. Gordon, John G. Schneider and Henry Krug, Jr. It is the intention of the new company to construct a new plant in a short time, more suited to their needs and with facilities for doing a much larger business.

The J. C. Bartlett Company, the new stove manufacturing company that intends competing in the Pittsburg district with the Pittsburg Stove & Range Company, has purchased the entire plant of the United States Radiator Company at West Newton, Pa., and will begin at once fitting it up for the manufacture of all kinds of stoves and ranges. The plant is a large one, and consists of two molding rooms, one two-story pattern shop, one mounting shop, and a large storage warehouse. The property comprises about three acres and has a siding that connects

the works with the Baltimore & Ohio and Pittsburg & Lake Erie Railroads.

At a recent meeting of the Board of Directors of the Norway Iron & Steel Company, held in York, Pa., contracts were let for their new plant. The plans call for a foundry 246x80 feet, built of brick, with iron roof trusses and slate roof; an annealing house, 220x65, with brick walls and iron roof trusses; a two-story brick building 140x40, for warehouse, machine shop, carpenter shop, pattern shop and rumbler room; a two-story brick office and chemical laboratory, also engine house, sand house, brick storage house and other buildings. This company will make high-grade castings in steel, malleable iron and other metals. The steel castings will be made of open hearth steel, by a special process which insures the production of a solid casting of uniform quality, free from blow holes and internal defects, of smooth exterior, easily machinable, malleable and ductile, and in all physical qualities claimed to be equal to the best steel forgings. The capital stock of the company is $200,000, and the officers are as follows: President, Charles I. Nes; vice-president and general manager, Charles James; secretary, H. H. Weber; treasurer, J. M. Smyser.

The Acme Harvester Co., of Pekin, Ill., will erect a new plant on the line of the Peoria & Pekin Terminal Railway, the post-office address of the company being changed to Peoria. The Acme Harvester Co. has also purchased the plant and business interests of the Harvester King Co., at Harvey, Ill., and will remove the machinery of same to their new plant. In the plans of the factory as now contemplated, there will be six separate buildings, covering a total floor space of fifteen acres. These will be of iron and brick construction, and the added capacity will be three times and in some departments five times, greater than the present plant at Pekin. The foundry will be 80x420 feet, and the wheel room and blacksmith shop will be of similar dimensions. Then there will be three buildings devoted to the manufacturing proper, and one where the parts will be assembled and the finishing done that will measure 80x340 feet. Of the manufactured products of this factory, there will be eighteen styles of headers, three of mowers, four or five of sweep rakes and stackers, five or six of hay-baling presses, and about thirty kinds of spring tooth rakes. Five hundred skilled mechanics will be the minimum number that will create the output, which last year exceeded a million dollars in value. The Acme Harvester Company is now almost forty years old, and was established and fostered by the veteran of manufacturers, A. J. Hodges. Since its inception the capacity has been increased probably a dozen times, and the pressing demand at the present time is for added facilities to meet the demands of the trade. Ten years ago, W. H. Binnian assumed the proprietary interest, which he still holds, in connection with H. C. Stone in the same association.

Tribute to Lazard Kahn.

Previous to his departure for the Paris Exposition, where he will act on the jury of awards, Mr. Lazard Kahn, of F. & L. Kahn & Bros., Hamilton, Ohio, was tendered a banquet by the employes of the works. The occasion brought forth many happy responses, tending to show the pleasant relations existing between the company and the men who turn out its products.

The Negro Molder in the South.

Looking backwards fifteen years will bring us to a time of industrial activity, the very first beginning of boom-days and better times with higher wages in most of our Southern cities. Foundries were built everywhere, and, where trade conditions were favorable, are in existence to-day, doing well, increasing their capacity every year and giving employment to a considerable number of molders. Ninety per cent. of the molders at work in those days were Northern men, who had just left their respective homes to seek, in some cases, a more remunerative position. The apprentice system was in its infancy. Southern boys at first did not take very kindly to the idea of doing hard manual labor, and as a consequence foundrymen were compelled to look somewhere else for additional labor. Right here, let us stop a minute and see why a surplus of Northern molders was not desired. In the first place, very few of these men would work steady every day in the year. Three-fourths of them would pack up their tools as soon as the bluebirds were singing their traveling song and very often leave their employer in the midst of a rush in orders. Many of our Southern firms can testify that business has been handicapped time and again by the sudden determination of their mold-

ers to quit and leave for home! We will give the excuse of unsatisfactory climate some consideration. But how often do molders abuse themselves to such an extent that no climate, however pleasant it may be, will suit their ideas. The calm, extremely sober way of living down here has driven many members of our craft back to their more exciting haunts of olden days. To be sure, a large number of men have left Southern employment to my knowledge who could not accommodate themselves to our water and climate and our mode of living, and as a natural consequence the employers were compelled to look somewhere else to furnish the vacant floors with molders, and the substitute has been the negro.

No Southern shop is running to-day where negro help is not employed in some form. He may be a cupola-tender, stockman, flask-carrier, casting-cleaner or helper to some molder working on large work, or he may only shake out and cut sand; but he is to be found and in his idle time makes it his business to pick up a few points pertaining to our trade. Out of this class of colored labor the first recruits for negro molders were taken, and Chattanooga, Tenn., foundries were the first to try the experiment, which has, so they claim, proven a success for the manufacturers, while it is an eyesore to the white man. To-day half of the foundries of the above-named city employ negro molders, whose minimum wage is lower than that of their white fellow-workers.

The trouble that confronts us is the fact that colored labor is taking white labor's places at lower wages, thereby destroying their means of making a living in such shops, and forcing the men to seek employment somewhere else. How to overcome these self-inflicted difficulties would involve any amount of discussion without satisfactory results, for we must bear in mind, and cannot deny the fact, that a majority of the colored molders are turning out remarkably good work; we cannot afford to overlook this, and therefore should be less radical in our so-called remedies. Taking a broader and more conservative view of the situation should be our aim, and in doing so we cannot but be impressed with the fact that our trouble has a parallel in the North in the shape of the molding machine operators.

It was clearly demonstrated at the last convention that all men working at molding machines should be under our control; the fact is accepted that such a course is necessary if we would fully conserve our interests. Here in the South we must control the negro molder and with him his job, for he is here to stay, just as the machine is. Nothing on earth could induce him to give up a trade which puts him socially above his fellow day-hand darkies. I maintain, as I always have, that they first should be taught to appreciate the work of our organization with its numerous benefits. Efforts should then be made to have them organize as a separate local. Very often the remark is made that it would never be successful for the reason that no white Southern molder would care to associate with a member of such a local. In reply to that criticism will state, that no necessity exists to do so, for it is as easy to maintain a color line in our union as in any of the many secret organizations. We cannot expect to make any headway as long as the colored men's confidence in us is not an established fact. We should be prudent and strictly honest in our dealings with them, and if possible, solicit the assistance of some intelligent colored man in organizing.—H. M. Shellenburg, in Iron Molders' Journal.

Personal.

E. E. Sweeney, of Chicago, has been appointed foreman of the foundry department of the Litchfield (Ill.) Car & Foundry Company.

Chas. Grant, for many years foreman of the foundry of the Moline (Ill.) Pump Co., will hereafter have charge of the Campbell & Tubbs foundry at Maquoketa, Iowa.

E. J. Armstrong, for many years superintendent of the Ames Iron Works, Oswego, N. Y., has resigned that position to accept a similar one with the Ball Engine Company, Erie, Pa.

John C. Rahe, of Baltimore, has been appointed manager of the Wilmington (Del.) branch of the Central Foundry Company. This position was filled by Henry C. Pickels until recently, when he resigned.

Harris Tabor has resigned the presidency of the Tabor Mfg. Co., Elizabeth, N. J., and Wilfred Lewis has become president and engineer. Mr. Tabor will hereafter act as consulting engineer for the company.

Arthur Brown has resigned his position as assistant superintendent in the H. B. Smith foundry at Westfield, Mass., and has

accepted a similar position with the Richmond Stove Company of Norwich, Conn.

T. P. Kimman, assistant mechanical superintendent of the Standard Pneumatic Tool Co., Chicago, will represent that company at the Paris Exposition and superintend its exhibit of pneumatic tools and appliances.

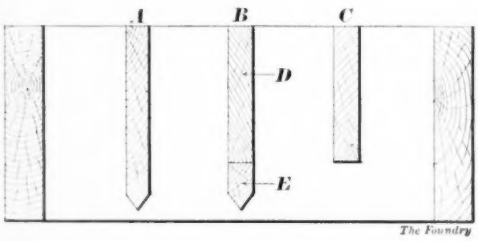
F. B. Holmes & Co. succeeds Holmes, Strachan & Co., of Detroit, Mich., Mr. Holmes having purchased the interests of the late Mr. Strachan, who died unexpectedly, April 8. The business will be conducted as heretofore.

Improved Flask Bars.

BY F. A. B.

The attached sketch shows an improvement in making flask bars, which I have found to effect quite a saving, not only in material but also in labor employed to keep the flask in repair.

At A is shown a section of the common style of flask bar. B represents the new bar complete, it being formed of the stationary portion D and the extension E, which may be removed, changed or renewed as the pattern calls for without disturbing the main part of the bar, D. At C is illustrated the permanent section of the bar.



The Foundry

In order to accommodate jobs in the average foundry, flasks are subjected to a continual knocking about, every new job generally requiring some change in the bars, commonly effected by removing the old bars completely and inserting new ones of the right shape. By the method shown, that part likely to be burned away may be renewed at a small cost a great number of times without disturbing the sides of the flask.

The extensions may be kept on hand in lengths of from ten to sixteen feet, when they can be cut up to fit the flask for which they are to be used. In this way the shop carpenter or the molder himself can in a surprisingly short time make necessary changes.

The Production of Open Hearth Steel in the United States in 1899.

The production of open hearth steel in the United States in 1899 was 2,947,316 gross tons, against 2,230,292 tons in 1898, an increase of 717,024 tons, or over 32 per cent. The following table shows the production of open hearth steel ingots and direct castings by States during the past four years, in gross tons:

States. Gross tons.	1896.	1897.	1898.	1899.
New England...	48,055	51,402	47,381	57,124
N. Y. and N. J.	32,120	39,521	47,957	61,461
Pennsylvania ..	1,009,608	1,271,751	1,817,521	2,393,811
Ohio	64,691	78,357	79,886	117,458
Illinois	101,832	120,609	183,103	246,183
Other States....	42,394	47,031	54,444	71,279
Total	1,298,700	1,608,671	2,230,292	2,947,316

The open hearth steel made in 1899 was produced by 77 works in fourteen States—Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Maryland, Alabama, Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota and Missouri.

In 1898 the production of open hearth steel by the basic process amounted to 1,569,412 tons, and by the acid process to 660,880 tons. Of the total production last year 2,080,426 tons were made by the basic process and 866,890 tons were made by the acid process, as follows:

States. Gross tons.	Basic open-hearth steel.	Acid open-hearth steel.	Total. Gross tons.
New England.	16,171	40,953	57,124
N. Y. and N. J.	26,439	35,022	61,461
Pennsylvania .	1,716,017	677,794	2,393,811
Ohio	64,462	52,996	117,458
Illinois	213,643	32,540	246,183
Other States ..	43,694	27,585	71,279
Total	2,080,426	866,890	2,947,316

The total production of open hearth direct steel castings in 1899, included above, amounted to 169,729 gross tons, of which 39,689 tons were made by the basic process and 130,040 tons were made by the acid process. In 1898 the production amounted to 120,587 tons, of which 28,460 tons were made by the basic process and 92,127 tons by the acid process. The following table gives the production of open hearth steel castings by the acid and basic processes in 1899, by States:

States—Gross tons.	Acid castings.	Basic castings.	Total.
Mass., Conn., N.Y. & N.J.	21,640	.....	21,640
Pennsylvania	66,117	3,879	69,996
Ohio and Indiana	28,395	.....	28,395
Other States	13,888	35,810	49,698
Total	130,040	39,689	169,729

Our total production of open hearth steel ingots and castings has more than doubled since 1896; when we made 1,298,700 tons. In 1899 our open hearth production came very close to that of Great Britain, which was 3,030,251 tons.—The Bulletin.

A New Classification of Scrap.

The Republic Iron & Steel Company have adopted the following as their standard classification of wrought and steel scrap:

A No. 1 Railroad Wrought: Links, pins, bars, rods and all heavy iron from railroad shops and cars, 8 inches and longer.

B No. 2 Railroad Wrought: Track bolts, spikes, nuts, channel bars and mixed angle bars.

C Shafting: Iron and soft steel, 1½ to 4 inches, round and square; 4 feet and longer, in straight bars.

D No. 1 Wrought: Bars ⅝ to 4 inches, round or square; flats ¼ inch thick and heavier; all 4 inches long or longer; exclusive of wagon and buggy tires, shapes, and all bent pieces not suitable for fagoting.

E No. 1 Country Wrought: Iron and soft steel rods and bars, wagon tires, axles and horseshoes; not less than 75 per cent. to be fagoting scrap and horseshoes, free from cast, malleable, hard steel and sheet iron.

F No. 1 Mill: Iron and soft steel bars, not less than ⅜ inches, round and square, and flats not thinner than No. 12 wire gauge; tank in sheets and rings, crown bars, pipes and flues (clean and free from lime), punchings and clippings. May be 8 inches and less.

G No. 2 Mill: Iron and soft steel hoops and sheets, cotton tie clippings and ties, and iron too light for No. 1 mill; wire rope 10-foot lengths and under, wire netting, free from galvanized and tinned stock, tangled wire and skeleton sheet scrap.

H No. 1 Busheling: Iron and soft steel pipes and flues (clean), tank and bands, No. 12 and heavier, boiler plate punchings and clippings, and soft steel and iron spoiled drop forgings and trimmings; nothing to be over 8 inches or wider, free from galvanized or tinned stock.

I No. 2 Busheling: Cut hoops, sheet, cotton ties, and similar light material; nothing to be over 8 inches long or wide; bundled wire and bundled sheet, suitable for busheling without further preparation; bundles not to weigh over 40 pounds, and not to be over 15 inches square; all free from hard steel, cast and malleable, and galvanized or tinned stock.

J Turnings: Iron car axle turnings and chips.

K Turnings: Soft steel car axle turnings and chips.

L Turnings: Machine wrought and soft steel, clean and free from borings and drillings, other metals, dirt and lumps.

M Drillings: Wrought or soft steel, clean and free from other metals, dirt and lumps.

N Cast Borings and Drillings: Clean and free from other metals, dirt and lumps.

O Mixed Borings and Turnings: Clean and free from other metals, dirt and lumps.

P No. 1 Boilers, Cut: Sheets and rings; rings to be 30 inches in diameter and over, and rivets cut at all seams.

Q No. 2 Boilers, Cut: Under 30 inches in diameter and riveted flues, 16 inches and less.

R Boiler and Ship Scrap: Bar and shape ends, punchings and shearings, free from curly clippings and hard steel.

S No. 1 Cast: Machinery and railroad cast, no piece to weigh over 75 pounds.

T No. 2 Cast: Stove plate and railroad locomotive grate bars, free of burnt iron.

Car Wheel Founding.

At a recent meeting of the Pittsburg Foundrymen's Association, Mr. C. V. Slocum, formerly secretary of the Pennsylvania Car Wheel Co., spoke of the severity of the tests to which the car wheels are put by the railroad companies before they are accepted was explained. He stated that the wheels are tested in lots of 103, three wheels of each lot being set aside for the purpose of being tested by the inspectors for the railroad companies. From each heat a standard test bar is secured and several other test pieces are also made. The test pieces are 1¼ or 1½

inches thick by 2 inches wide and 6 inches long, and are cast with the 2x6-inch face against the chill. The bar is given a transverse test, and in many cases showed more than 4,000 pounds. The test pieces are examined for depth of chill, etc.

The three wheels are next tested. They are picked at random from the lot. One wheel is selected for the drop test. The hammer weighs 140 pounds and drops a distance of 12 feet. It trips automatically, and the wheel must stand ten blows before being broken in two, or the entire lot of wheels is rejected. If the wheel is not broken in two with ten blows, it is hammered until broken. The depth of the chill on the broken parts of the wheel is then measured, and the metal examined to see whether it meets with the specifications. The other two wheels are then given the thermal test. The wheels are laid in sand, and molten metal is poured against the flanges and treads. The wheels must withstand successfully the expansion of the metal, and if they crack through the flange or tread in less than two minutes, the entire lot of wheels is rejected. If the wheels stand this test they are taken to a drop, broken, and again examined for the depth of chill, thickness of plates, general quality of iron, and other tests. The entire lot of wheels is carefully examined by the inspectors for every visible defect, such as the thickness or thinness of flange, pin head bubbles, etc. If any wheels are found that have these defects they are thrown out, but their rejection does not necessarily affect the entire lot of wheels. Mr. Slocum added that the car wheel manufacturer must guarantee the wheels that pass inspection for freight service for five years, or to run 70,000 miles. If the wheel does not hold out this length of time it must be replaced by the manufacturer. If it can be proved that the wheels are slid flat or burned, the manufacturer cannot be compelled to replace them.

The speaker was asked whether other than charcoal iron had not proved satisfactory in the manufacture of car wheels. He replied that other irons have proved satisfactory in many respects, but do not give the chilling quality. Titanium has been used in the mixture, and, in some instances, steel, while in others coke iron has proved successful. If coke iron can be used successfully in the manufacture of wheels it would be much cheaper than the charcoal iron. The trouble with the coke iron, he explained, was that it did not give the depth of chill required by the specifications of most railroad companies, and was not used very extensively for that reason.

He mentioned molybdenum as one of the metals that had been used with some success in metal mixtures for car wheels, but its cost was so high as practically to prohibit its use for this purpose.

Mr. Slocum was then asked at what temperature car wheels were poured. He stated that the metal was poured as hot as possible, and, as it takes from 10 to 13 seconds to make a cast, there would be practically a uniform chill. The chills are coated every cast with a mixture of varnish and shellac. This gives the tread a fine texture and lengthens the life of the chills. Two wheels cannot be made in one day with the same molds, for the reason that they must be allowed to cool before being used again. After the wheels are cast they are placed in annealing pits, where they remain for from four to five days. Slow or rapid cooling, however, has no effect on the chill.

The different sizes of chills have been an eyesore for years to the car wheel manufacturer, said Mr. Slocum. The master car builders, however, are getting together in the matter of chills, and the chief annoyance at present is from the street railways. The latter do not require as severe a test as the steam roads, but demand that the wheel be guaranteed for from eight to eighteen months. Street car wheels wear out more quickly than those of steam roads, partly because the motormen are so careless about sliding the wheels, and further because they are much lighter than those used for steam roads. The price of wheels then came up for discussion, and it was stated that old wheels bring more at present than new ones one year ago.

The manufacture of chilled iron wheels in Europe was next touched upon. In Austria-Hungary, Mr. Slocum stated, chilled iron wheels have been manufactured in recent years, the plant being constructed by American engineers. In France a foundry was erected last year, and one is to be built in England very soon. The initiative in the use of chilled iron, however, is from this

country. The wheels extensively used in Europe at present are of wrought iron, and are welded together by hand. It requires 1,000 men to make 200 wheels per day by this process, while with chilled cast iron the same number of wheels can be made by less than 100 men.

Regarding the so-called paper wheel, Mr. Slocum said that its use was very limited. The rim is steel, and the hub is of iron. The center outside of the hub is of papier mache. Less than 10 per cent. of the car wheels now in use are of this type.

Smart Aleck's Idea.

BY JIM HENRY.

For the last few weeks we had been receiving daily complaints from the machine shop. Castings were too hard. Milling cutters, planer tools, drills, scrapers and the various surgical instruments of the mechanical craft were acquiring that nice blue tint with a suddenness and thoroughness that made everyone deface the clean page of last New Year's resolutions. The "Old Man" and our foreman had many of those nice, quiet, calm talks together, and then we, of the line, prepared for the coming storm. Of course, it was all our fault; "Jim" rammed too hard, "Bill" not enough, "Jack" squirted too much water and saliva emulsion on his mold, "Aggie," the coremaker, was also accused of making the water-meter register too high.

And so it went—we all got our medicine. Even the poor belt-tender was hauled over the coals for having the blower-belt too loose, thereby causing dangerous variations of air pressures.

When the cupola was to be charged, that most mysterious and gray-matter destroying operation nowadays, the mixer and his assistants, were given lessons in most accurate weighing.

We noticed that all the samples of different grained iron were off the shelf, with the ancient books on chemistry, and the waste-box was half full of computations and deductions.

Well, the next heat was poured without mishap, and before we received the machine shop's verdict a few of us fellows that regularly read THE FOUNDRY, and knew that 7 and 8 makes 15, went in quest of information in the mixing and pig storehouse.

Our surmises were about correct. We noticed a big hole in the softener pile, and that new expensive iron, used with the stove-scrap, was also near the bottom, and the long expected new shipment was now about four months behind. On the blackboard we found many combinations of irons, on the order of "Mammie," "Letalonia," "Queen Elizabeth," etc.

Well, however, that heat was soft, "all right." About twenty surface plates were cast. The planer hands had a "cinch," as well as the scrapers. In fact, the plates were rubbed down to a dead bearing in jig time. Coarse? You could stick a pin in anywhere; the polishers could not get a burnish, and the assemblers, in general, were complaining of waste and rag sticking in the pores, giving the red-leaders and rouge-daubers trouble from false bearings.

Spindles got cutting and their bearings were hard to keep clean, the grit and fuzz remaining in the cavities.

Our mixers were in a fix: "Them machine fellers ain't never satisfied." One suggested pouring pigs of the hard iron one heat, our "sponge cake" pigs the next, and mixing them up. We locked the poor fellow up. Then it was that Smart Aleck stepped forward and had a long talk with the foreman. The word was passed that something new was discovered in the art of iron molding. In fact, Aleck was hinting of something new he had discovered or generated, and of generated patents. He must have meant generic.

In a short time the lips on the ladles were made longer, and the order was given to make all the head-boxes wider at the top and tunnel shaped. We could not imagine for what reason, until casting time, when our foreman announced that now we were going to have a medium soft and close-grained iron that would be all right. The first ladle poured showed what was up. The crane-tender was ordered to hoist, until the ladle was five feet above the head. Step-ladders were at hand and the pouring was about to commence, when the head workman on that mold, a fine, intelligent young fellow, objected, told the foreman that he thought there would be too much pressure, but the answer he received was: "That's just what I'm after, can't ye see I'll get more fall, and that makes pressure; you orter know that if you've ever seen a water-wheel; and then we'll have a nice, firm casting; all the blow holes and gas will be forced out." It was in vain that "Jack" called his attention

to the head breaking in, gates cutting and cores shifting. The "Old Man" was "sot" and the new idea must be tried. It was tried. They wanted more pressure and forcing action, and in the first few moments they got it. On some of the lighter and thinner parts of the cope, young volcanoes and miniature geysers were created.

Of course, as soon as the head became full, only the normal pressure was exerted inside the mold, but that was something which could not be reasoned out with foresight, but must be settled through the more expensive path, the hindsight.

Two days afterward the "kid" that does errands to the pattern shop, reported that he saw a sign being made which read something like this: "No New Notions Needed in This Foundry." But we think they are. Don't you?

Cone Pulleys.

BY GEO. BUCHANAN.

Making a cone pulley is not a difficult matter. Making a well-balanced cone pulley is not a hard job at all if we go the right

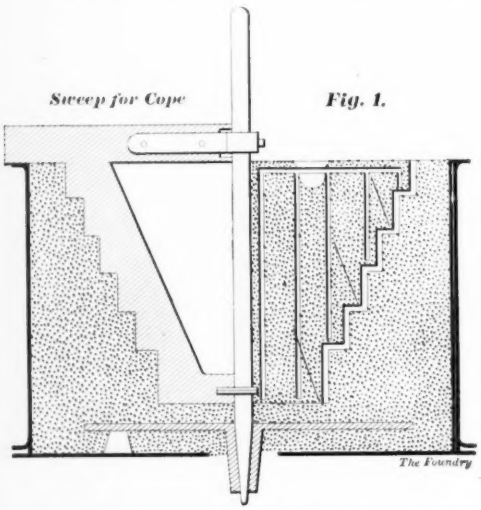


Fig. 1.

way about it. It is very often not the molder's fault if the casting is not a good one; he makes a good mold and sets his cores as well as he can, but he is not half satisfied; now if we give him a certain means of setting his core, he is confident, because he knows the job will go through all right after it has left his hands.

Some years ago I got a cone pulley to make, and as none of our standard sizes would suit, a wooden outside was turned up and core formed with strickle and spindle; the print was on bottom of small speed and cope and the core formed a level joint. Passing through the turning shop later, I saw my pulley was not running very true at the small (print) end. I suggested that we

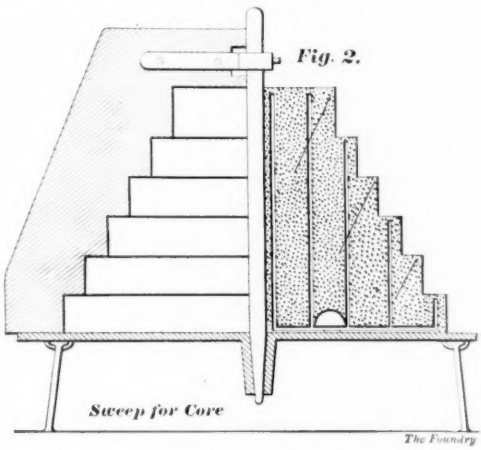


Fig. 2.

should make the next pulley that came along a certain way; the foreman was agreeable, and shortly afterwards we started remodeling our lathe and wanted new standard cone pulley patterns (iron patterns, of course), so I had a good opportunity of testing the following method:

Two strickles are made, one for the cope and the other for the core—Figs. 1 and 2. Both strickles are the same depth. Having found a box to fit the job, the spindle center is set in bottom of cope, strickle is fastened to spindle, and bricks thrown in corners

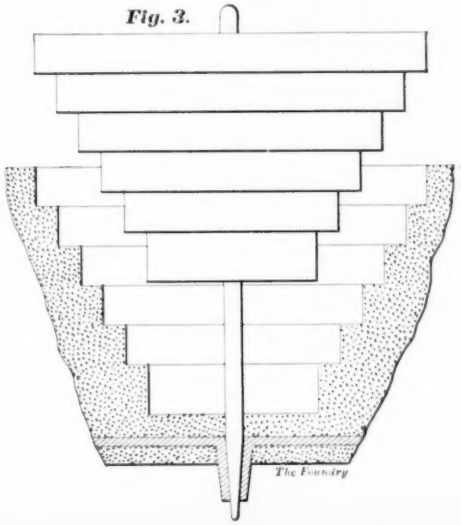


Fig. 3.

where sand will take too much drying. The mold is faced with core sand and patted about a quarter inch back from strickle; it is then well dampened with thin clay wash and finished off with fine loam. The core is made the same way, and it forms a good mold, free from cracks, and it will not sag, but keeps its shape perfectly. In making the core the sand is rammed well around the spindle, so as to form a good hole. When the mold is dry the spindle is put in the cope again and the core turned over and lowered over spindle, giving a perfect central guide, as shown in Fig. 3. These pulleys were all that could be desired, having a perfectly even thickness.

Draw and Rapping Plates.

BY EDWARD T. WIRES.

Most rapping and draw plates are made of a strap of wrought iron provided with screw holes for securing to the pattern, one-half inch hole for rapping and one threaded to fit a half-inch bolt for drawing. The fact that these holes go clear through the plate allows the sand to become packed down and under them by the pressure of the rapping bar and draw iron, especially when the threaded draw iron is screwed down, and it will soon strip the screws and lift out the plate or burst the bottom out of the pattern. Nearly all cast plates have their rap and draw holes clear through them, but the difficulties I experienced caused me to make a plate like Fig. 1, with a solid bottom in it, and containing a chambered passage between the holes to allow the sand when crowded from one hole to escape to the

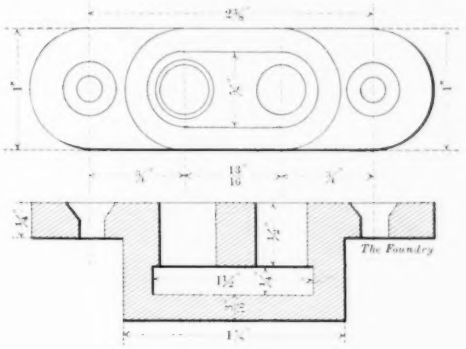


FIG. 1

other, one hole being to rap in and the other threaded to draw by. Afterwards I made a heavier plate for four screws, with two threaded holes and two holes to rap in, still retaining the chamber connecting all four of the draw holes, like Fig. 2.

These worked all right also, as far as providing against the threaded draw iron lifting the plates out of the pattern, but the

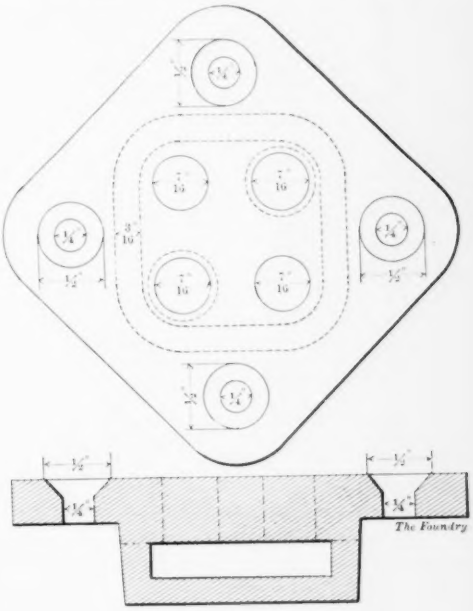


FIG. 2

threads would soon wear out, when the molders would drive their draw spike (the greatest pattern destroyer in the foundry) into the pattern to draw it out with. These plates, while they did not do away with the draw iron altogether, are the best draw plates for heavy patterns I have been able to find. For all small patterns, that is, those not weighing over twenty pounds, the draw spike ought never to be used. For this class

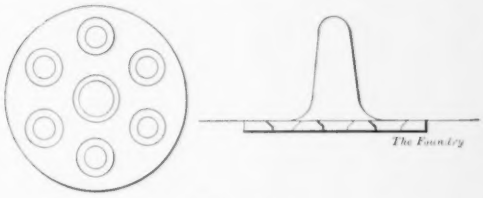


FIG. 3

of castings I make a plate with a tapered pin cast thereon (see Fig. 3), for the molder to rap against and take hold of to draw his pattern with. This took so well with our molders that every piece-worker wanted them on his pattern at once.

Innovations in Pipe Making.

Work on the new plant of the North Pittsburg Foundry & Steel Company, Allegheny, Pa., says a Pittsburg paper, will be commenced within a few days. The plant will occupy the former site of the Carlin Manufacturing Company, whose works were destroyed by fire about a year ago. The new company has secured additional ground, and it is the intention to build a modern plant. The new buildings will be of steel construction, completely fire proof throughout.

The leading product of the North Pittsburg Foundry & Steel Company is cast iron soil pipe. The new plant has been especially designed for this kind of work. A number of new devices have been invented by David Carlin, president and general manager of the company. The plant is to be operated on what is known as the continuous casting plan. The system invented by Mr. Carlin is applicable to almost all branches of foundry work; the greatest advantages, however, are gained where the castings are of such dimensions and weight as to cool quickly. The system is therefore especially adapted to the manufacturing of such specialties as soil pipe and fittings, bath tubs, sinks and hollow ware. At present the work of the company is being carried on in temporary buildings. Mr. Carlin has under consideration the question of installing his system in connection with another new plant for which a site is offered near Pittsburg, together with a bonus. The company which has the matter in hand is composed principally of eastern capitalists, who will manufacture a leading article in the plumbing trade.

Will the Coke Supply be Sufficient?

The Connelsville Courier points out that the coke production for 1900 is an important element in calculations concerning the output of pig iron: "It was pointed out in this review a while ago that the report which was going the rounds of the press stating the furnacemen were holding off for cheaper rates because of the building of so many ovens that the price would be lowered, was false, and this conviction has not dawned upon many. There is an impression growing that the ore production for the coming year will reach 20,000,000 tons. It will not matter what it reaches, because only so much iron ore can be smelted as there is coke to smelt. The fuel question has been overlooked. The number of new ovens is comparatively small. The three new plants in southern Fayette county will not be completed before next September, and will do little toward relieving the coke famine for 1900. The table shows 19,689 coke ovens, and before the close of next year the total number in the Connellsville region will not be much more than 20,000. If 21,000 ovens can be operated for the year full time, the total production will not reach much beyond 11,500,000 tons, so that furnacemen can gauge the situation with that amount of coke not far from the limit on which to base their calculations."

Copper and Brass.

Among the great booms that have occurred in various lines of industry during recent years, none has been greater than in copper mining and the manufacture of copper and brass, comments Trade. The long-distance telephone and the construction of metallic circuits for short distance service, as well as its innumerable uses in street railway circles, has made an unusual and unprecedented demand for tons and tons of copper wire, and the great increase in the use of copper for various purposes has helped to swell the demand, which is so great that the miners are unable to produce the ore and native copper fast enough.

This has caused the opening of new mines and the reopening of old, abandoned ones in all copper producing localities, and a corresponding rise in prices of the metal and the mining stocks.

The Trade Journal.

The trade journal is not a newspaper, as the term is generally understood. It is strictly business. It is a purveyor of industrial information, and of all things related thereto. Every class of industry has its representative paper. The shoemaker, the boiler-maker, and the candlestick-maker; the cotton spinner, the glass manufacturer, the architect and the engineer; the man who handles jewelry, and he who makes pig iron, tin plates, or horse shoes, and all the way along the line from a pocket knife to a locomotive, can put his finger on what he wants to know in his particular trade journal, as easily as he puts on his gloves or

his hat. Nothing can take the place of the trade paper in this matter. The average newspaper has neither room nor inducement to specialize on strictly technical matters. The general public demands something more savory and sensational, and has no direct interest in what is being done in a machine shop or a shipyard. The taste for spiced viands has to be gratified, and a yacht race or a prize fight, a sensational crime or a malodorous scandal, is a raker in of shekels and a feeder of popular patronage. The trade journal is not a garden of garlic, or a laundry for politicians, and its patrons are restricted to industrial circles. In this lies its special virtue. It has one object and it sticks to it. If a manufacturer wants a machine or a mechanic, or latest improved tool, he has but to consult his trade journal to get in its pages what he cannot get elsewhere. He can make his comparisons of cost and efficiency, can place his orders at the price of a postage stamp, and with a pen or a typewriter can in a few minutes make and close important transactions. It is the trade journal that makes this possible. Otherwise the sales agent or the vagrant circular, and a mail bag of inquiries would be the time-eating and money-eating conditions of locating a manufacturer, and getting a full text of his specialties. It is this feature of the trade journal that makes it the best advertising medium of modern times. It brings buyer and seller in close contact. The arrow goes straight to the mark. If a pump is needed or a windlass, a lathe, or a drop hammer, an anvil or an iron bridge, the advertising of the same in the trade journal is frequently the only up-to-date directory of places and persons where such can be had. It goes without telling that most of the sales of machinery, tools and related equipment, are brought about by advertising literature in trade journalism. This fact in many instances ought to be more appreciated than it sometimes is, at the selling end of modern business.—Age of Steel.

The Elasticity of Chilled and Ordinary Cast Iron.

Prof. C. Bach, the well-known testing expert, made a series of tests on chilled cast iron recently which are intended to bring out information on its elasticity heretofore not available. The primary incentive to these experiments was the failure of a ball bearing the wearing surface of which has been chilled. It was desired to make some comparisons of the iron in its natural condition with the same material when chilled, so a number of tests were cast from the same ladle and subjected to tensile and transverse test for elasticity. The tensile specimens had the form closely followed in the A. F. A. series of tests on cast iron, and were in addition ground off square on the ends to admit of compression. The first series of tests was made upon four bars, two of which had been chilled, the mixture used being chill roll iron. The bars were loaded increasingly, the elongation and permanent set being measured in each case. A summary of the results gives the modulus of elasticity of the chilled iron as compared with that of the same iron in its natural state as much less variable and over one-third higher. The actual figures converted into our system are 11,932,500 down to 11,029,500 for the chilled iron, and 8,610,750 down to 7,559,400 for the same iron in its natural state.

The next set of tests were made on four similar bars subjected to compressive forces. The first specimen was chilled on two sides only so that a thin layer of soft iron was observable in the interior. The modulus of elasticity in this case averaged 10,846,000. The second test piece, chilled on all four sides, ran 11,815,700, or somewhat higher, while the last two specimens, in which the iron was not chilled, had an average modulus of rupture of only 8,127,000. A comparison of the two methods would seem to show that the results are closely comparable. The third set of tests was made on six rectangular bars loaded transversely. The distance between supports was 36.36 inches, and the load began with the application of 330 pounds at the center. From the elaborate table of results the following are taken: Two bars chilled on two sides, or nearly altogether white, averaged 11,281,000 for the modulus of elasticity. Two further bars, chilled on one side, tested chill side down, ran 10,158,700. Another two cast the same but tested chill side up, gave 9,675,000, showing the yielding nature of the soft iron at the bottom of the bar. The last two bars of this set were not chilled, and had an average modulus of elasticity of 8,707,500. A final trial was made with a tensile test bar turned out of a soft square transverse

test specimen. This was loaded to get the modulus of elasticity and then tested to destruction. The drop in the first case to 7,759,400 shows the stiffening effect of the skin of a casting. The tensile strength of the particular iron was 27,000 per square inch.—R. Moldenke, in Iron Trade Review.

Encourage Ambition.

BY L. C. JEWETT.

The article by Mr. James A. Murphy in the May issue of THE FOUNDRY is very interesting and instructive. While reading it, it brought back to me an incident that occurred in a foundry some years ago which tends to show how little encouragement a young molder sometimes receives from his foreman.

box was made and everything ready to pour, the distance between the runner and the surface of the inner portion of the green sand mold, on which was imbedded a fire brick, was about eighteen inches. With metal falling direct upon the convex surface and where a chilling mixture is required, a firm and resisting surface is required and hence the use of the fire brick.

The lines in the mold show an imaginary action of the metal as it is poured through the chill, when, striking the fire brick, it is divided into spatters and goes bounding and rebounding to the bottom followed by more metal until the mold is filled. The first metal entering the mold, coming as it does in contact with the cold sand and colder iron chill, is congealed and the divided particles are rendered as hard as glass. The following

Fig. 1

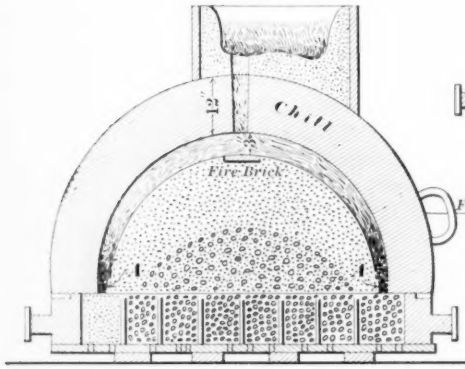
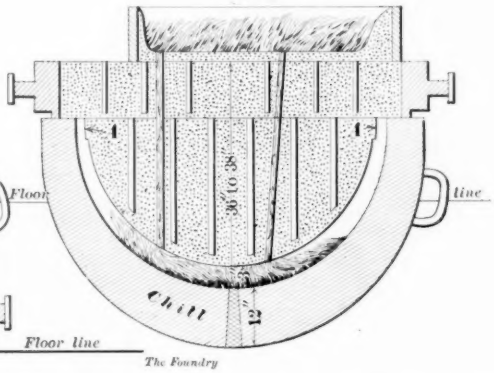


Fig. 2



The circumstances connected with same also show the presence of peace disturbing ghosts that ever haunt and hover about the foundryman's path. I enclose two sketches almost identical except the position of casting the mold. These represent the method adopted of chilling the back of a chilled cast iron burglar proof safe. The size of the largest of these was about three feet six inches in diameter, the thickest part of the casting being three inches thick with a decreasing thickness at the sides.

These castings were chilled from an inch to an inch and a half for the purpose of bothering the persistent burglar with his insinuating drills. The chill was quite a massive affair being twelve inches thick.

The first castings were made after the method shown in figure 1, pouring the casting with the crown up. When the runner metal is much reduced in temperature and is not hot enough to convert these globules into a liquid state again.

After the chill was removed from this casting, chill cracks, so-called, were invariably found around the bottom part of the casting. There would be several of these running up so far as ten or fifteen inches, and in some cases these chill cracks were so prominent that it became necessary to break the casting up and melt it over again. Another discouraging feature was that there had to be a coarse thread cut around the inner portion of this casting, A A fig. 2. While the casting looked smooth and apparently perfect when it left the foundry, no sooner would it be put on the boring mill and the tool started to cut the required thread than a hardened shot would be struck and zip would go the point of the tool. Then

came the digging out of the offender, which would vary in size from that of a pea to a bantam's egg, and would be as hard as a diamond, requiring an immense amount of labor, and after all the casting might not be saved as other shots of the same kind would be encountered, resulting in condemning the nearly finished casting to the scrap heap. These ever present cracks and bugs made the melter (as he was accused of charging bugs into the furnace which he denied with indignation) molders and even the neighbors talk in low tones.

At a solemn inquest held over a derelict condemned for excessive chill cracks, a young molder suggested to the foreman that the chill should be let into the floor and the job cast the other side up, as shown in figure 2, when in his opinion there would not be a chill crack in the casting so made.

The foreman said the bottom would drop right out of the casting if this expensive kind of tom-foolery was tried. The young molder insisted that such would not be the case, his theory being that the chill cracks were caused by the first metal entering the mold forming a thin skin. Afterwards the large chill is being warmed up and commences to expand when the then thin skin is not strong enough to resist the pressure of the fluid iron behind it, the result being the skin bursts like a paper bag until it again finds support from the chill. When cast with the convex side down, as in figure 2, as soon as the chill expands, the casting settles and is continually supported just the same as ice melting in a funnel. The hard shot found in the casting right where the thread is to be cut, is caused by the metal entering the mold at the top and going with a hop, skip and jump to the bottom in divided streams that are completely congealed upon their arrival at the bottom where the succeeding metal is not hot enough to reduce them to a liquid.

Now did the foreman give the young molder a word of encouragement or show his appreciation of the fact that he had done something towards the solving of the problem? Not much, not even a look. The foreman gave to Jim, the oldest molder, a tired look that said, if it said anything, "We'll forgive him Jim, he's young yet." Said Jim to the young molder, "How much difference do you suppose your talk with the foreman will make? He don't take any stock in any suggestions but his own. You see, lad?"

Three or four days later the foreman come on the floor and said to Jim that the proprietor had thought of the cause and remedy for chill cracks in the safe backs upon scientific principles that would do away with all trouble. "Cast them the other side up and when the chill expands, the casting will settle so it will always have a bearing, consequently it can't chill crack." Why of course said the foreman with a self-satisfied smile, it stands to reason. Not a word was said to the young molder who was instantly reminded that this shop was not a good place to grow in.

"You see lad," said Jim to the young molder, "do you mind how much more wisdom the words of the proprietor have than the same language has when it comes from a sweating, blackened, clay-wash besmeared young molder?"

The change was made and chill cracks were afterwards unknown in that shop. Soon after the young molder said to Jim, "If these castings were run from the bottom, and I have thought of a way to do it, there would not be a bug in that part where the threads are cut. While there are less now than there were before, still there are enough to cause trouble and these are made by the spatterings from the chili floating upwards."

"Hoot mon," said Jim, "are you daft?" "Dinna ye sae, there is not e'en a thank ye in the foundry business?" "Keep it to your-sel' mon, ye'll draw your wage just the same, nae mair, nae less."

There is a great deal of truth in Jim's logic. Personally, I think a great deal of the system adopted by the National Cash Register Co., who have lately had their semi annual distribution of awards among their employees. Such a system of rewarding these, no matter what they are, whether journeymen or foremen, will do more to bring the employees and proprietors into closer and more harmonious relations than anything that could be conceived. Talk about your training schools. Such rewards for original ideas will do more to promote useful and mechanical suggestions among employees than anything else devised. The singular part of it is that so few manufacturing concerns seem to see the diamond in the uncut stone.

Blessed be he who writes in plain words, for he is understood by all.

Deaths.

Austin W. Goodell, of the firm of Goodell & Waters, Philadelphia, died recently, aged 68.

John Jessup Warren, treasurer of the Stamford (Conn.) Foundry Co., died recently aged 68.

E. D. Aiken, at one time interested in the foundry business at Butte, Mont., died there April 22, aged 62.

Peter S. Ferris, at one time engaged in the foundry business at Northfield, Minn., died there April 20, aged 48.

William M. Gaylord, for many years actively engaged in the iron trade, died at Northampton, Mass., April 21, aged 79.

Charles P. Haughian, president and founder of the Chrome Steel Works, Brooklyn, N. Y., died in that city May 2, aged 58.

William S. Merkel, of the firm of Schaeffer, Merkel & Co., builders of rolling-mill machinery, Fleetwood, Pa., died April 10, 55 years old.

A. De Marce, proprietor of the Texas Steam Engineering & Foundry Works, Texarkana, Texas, died on April 21, after a prolonged illness, at the age of 71 years.

Eli H. Pearce, senior member of the firm of Pearce Bros., Baton Rouge, La., died at

ELI H. PEARCE

his home in that city May 10, aged 30 years. Mr. Pearce took more than ordinary interest in the foundry business and has been a frequent contributor to our columns.

Francis W. Gibby, the president of the Mechanics Iron Foundry of Roxbury, a suburb of Boston, Mass., who died there April 17th, was born in St. John, N. B., on September 23, 1833.

He entered a foundry in that city when a little over fourteen years old and served an apprenticeship until he became of age. He came to Boston in 1856 and the first shop he

FRANCIS W. GIBBY

worked in was the Whiting Iron Foundry, it being the same shop that is now known as the Mechanics Iron Foundry.

In 1879, Mr. Gibby, together with Mr. J. A. Caldwell, of Boston, started a foundry at Neponset, Mass., but it proved too small and too far out of the way for the trade, and the Whiting Foundry having in the meantime become idle, the same was purchased.

Mr. Gibby was an active man and closely supervised all the details in the busy plant. At the first convention of the American Foundrymen's Association, held in Philadelphia, in May, 1896, Mr. Gibby was elected vice-president for the New Enngland States.

Oliver L. Stewart, secretary of the Laird Malleable Iron Co., Huntingdon, Pa., was instantly killed on May 3 by the bursting of an emery wheel at the company's works.

Eli I. Merriman, secretary and treasurer of the Meriden Malleable Iron Company, died on April 22 at Meriden, Conn., from congestion of the brain, aged 63 years.

Alonzo Whitcomb, founder of the Whitcomb Manufacturing Company, Worcester, Mass., manufacturers of iron planers, died March 28, 82 years old. Mr. Whitcomb had been building planers sixty years. He was also partner in the Kabley Foundry Company, of Worcester.

Peter McFarlane, head of the firm of McFarlane, Thompson & Anderson, Fredericton, N. B., died recently in his 55th year. After some years with the firm of Peter McFarlane & Sons, foundrymen, of Nashwaaksis, N. B., he went to Fredericton in 1870 and started the New Brunswick Foundry, now operated by the firm of McFarlane, Thompson & Anderson.

Fires.

The Victoria Foundry Company, of Ottawa, Ont., had their plant destroyed in the recent great fire of that city.

The foundry of Herman Bros., at Massillon, Ohio, was destroyed by fire May 1.

Clerkin & Maag, of Akron, Ohio, had their foundry burned recently. A new shop will be built.

The Beaver Dam (Wis.) Malleable Iron Co.'s plant was burned recently.

The Union Foundry Co., Rockford, Ill., had their foundry badly scorched some time ago.

Pig Iron Statistics.

The total production of pig iron in the United States during 1899, was 13,620,703 gross tons, with stocks on the market at the close of the year, 68,309 tons, says Swank's Bulletin of the American Iron and Steel Association, Jan. 22. The output of pig iron during 1898 was 11,703,934 gross tons, showing an increase of last year of 1,846,769 gross tons. Allegheny county, Pennsylvania, leads in the production of pig iron with 3,255,678 gross tons. The Shenango Valley, Pa., turned out 937,215 tons; the Mahoning Valley, Ohio, 932,165 tons. Pennsylvania leads in production with 6,558,878 tons; Ohio 2,378,212 tons; Illinois, 1,442,012; Alabama, 1,083,905 tons. These are the leading factors in the production of pig iron. The other states show the following productions: Massachusetts, 2,476; Connecticut, 10,129; New York, 264,346; New Jersey, 127,598; Maryland, 234,447; Virginia 365,491; North Carolina and Georgia, 17,835; Texas, 5,803; West Virginia, 187,858; Kentucky, 119,019; Tennessee, 346,166; Michigan, 134,443; Wisconsin and Minnesota, 203,175; Missouri and Colorado, 138,880. During the year Pennsylvania produced 4,473,493 tons of Bessemer iron, more than one half of the total output. Pennsylvania also produced more than one half of the total output of basic iron, Allegheny county producing 470,848 out of a total of 985,033 tons.

The most remarkable part of the pig iron situation is the amount of unsold iron in stock at the close of the year, which was 68,309 tons. The amount left in the hands of manufacturers Dec. 31, 1898 was 291,233 gross tons, showing a decrease in stocks of 222,924 gross tons.

His Own Mine.

A plow manufacturer needed fifty tons of a certain iron for mixing purposes, but found it impossible to obtain same promptly, even after the industrious application of all conceivable "old customer," "personal favor" devices. He must be an "Old Man," for he rigged up an apparatus in the shop yards, such as might be used for washing gold sand, dug up the walks and driveways, and refuse piles of grit and grindings which had accumulated during twenty-five years of business, and had washed out over thirty tons of iron when my informant saw him, and had raw material in sight for as much more.—C. M. Sames, in American Machinist.

The World's Record.

Newlin's foundry at Twenty-eighth street broke the world's record in aluminum casting Friday evening. A fire extinguisher cylinder, 20 inches high, three-sixteenths of an inch thick and having a diameter of seven inches, was successfully cast. The attempt had never been made before and the result proved more than satisfactory. Fire extinguisher cylinders heretofore have been made of copper, the ends of which are either riveted together or connected by a double lapped joint. The fact that aluminum must be melted at a very low temperature, about half that of copper and brass, else it would burn up into fine powder, shows the delicate nature of last Friday's experiment, and its success is an important step in this hitherto untried line of manufacture.—Pittsburg Post.

An Old Foundry.

Among the enterprises in this vicinity there is none which can boast of a greater antiquity than the foundry which is now carried on by Hon. Lincoln S. Drake at Easton, Mass. This business was established in 1760 and has continued through 139 years of change, being taken over in 1832 by the father of the present proprietor, Mr. Lincoln Drake, and in 1872 by Mr. L. S. Drake and his brother, A. L. Drake, and again in 1895 the present proprietor continued alone, so that the works have been operated by the Drakes for 67 years.—Brockton (Mass.) Enterprise.

Artificial Molding Sand.

BY L. C. JEWETT.

Referring to a recent inquiry in THE FOUNDRY concerning molding sand which lacks the proper bond and devoid of other qualities to be found in the ideal sand, a common remedy is to mix the facing sand with flour, the amount to be used depending upon the condition of the sand.

Clay wash is also used in many places for tempering facing sand, and in some localities for the entire sandheap. Nails inserted in the face of a mold is an efficient method of preventing cutting and scabbing, the heads being placed flush with the face of the mold or a little above it. Molasses water, made from the cheapest kind of molasses or sorghum, or sour beer, form splendid mediums to hold the blacking in place and increases the adhesiveness of weak sand.

A Question.

We make several iron castings, which are hollow, and ranging from 10 to 25 or 30 inches in diameter by about 6 inches deep. These castings are usually from 1 to 1½ inches thick, and, in order to comply with our clients' requirements, these have to be tested under cold water at a pressure of, say, 300 lbs. per square inch.

We find that some of these castings are more or less porous under the above pressure. What we want to know is, "How to overcome this difficulty." "Is there any preparation made, with which we could paint the inside of these cases in the preliminary stage, and prevent this porousness?"

PETERSON ENGINEERING CO.

Benefit of High Charging Doors.

I wish to ask the readers of THE FOUNDRY if there would be any advantage in building a cupola, 54 inches in diameter, 18 or 20 feet from the bottom to the charging door. The one we now have is about 12 feet deep from bottom to charging door.

Would we not be able to melt the iron with less coke by having more charges in the furnace at a time, also by having more charges put into the furnace before the blast goes on; the charges would be put into the furnace in better shape, and also in melting 8 to 10 tons, the iron could be all charged before putting on the blast? N. H.

An Old Concern.

The Means Foundry & Machine Company was the first foundry established west of the Allegheny Mountains. It began operations in 1816, and its products have found their way into almost every corner of the world. In one of the buildings of these works, William McKinley, Sr., father of the President, worked as a pattern-maker in the early twenties. The company manufactures steam sewer-pipe presses, pipe and tile dies, clay grinding and tempering pans, pug mills, blast furnace, rolling mill, glass works and coal mine machinery, steam engines, and all kinds of iron and brass castings. The works are located on the river bank, adjoining the Cleveland & Pittsburg Railway tracks, and cover grounds 500 feet square. They employ 100 men, nearly all of whom are mechanics of the highest skill. The business done with brick, tile and pottery manufacturers is very heavy, although they make every kind of castings for all kinds of machinery.

Eighty-four years of active business operations for an industrial establishment in the Ohio Valley is a record that even older sections of the country will experience no little trouble in beating. But the concern started when part of the New World was young and grew up with it, so to speak. The works have never been shut down, even during the periods of general depression. In addition to order work done in the Means Foundry & Machine Company's shops for the far East, West and Southern points, an export business of large proportions has been built up and is steadily growing in volume and value. The transactions of the company in Mexico and South America centers is particularly heavy. Extensive improvements

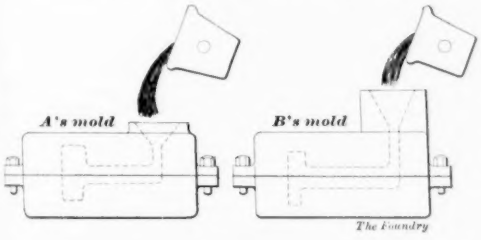
are now being made to facilitate the pressing strain upon the establishment's productive capacity.—Steubenville, Ohio, Correspondence.

The Pressure of Iron.

One of our readers writes: "The attached illustration shows two ways of pouring a mold, over which an argument has arisen between two practical foundrymen, as to the actual or effective pressure obtained in the mold.

"A claims that by holding the ladle about two or three feet above the head box he obtains as much pressure in the mold as B does, who raises the head box, thus making a higher gate and pouring in the ordinary way."

(The pressure of any fluid is regulated by its height. The higher the runner box is built up on a mold the greater will be the pressure in the mold. B's mold, having the



highest runner, is therefore subjected to the greatest pressure.

At the same time, there is something to be said about the method pursued by A in pouring. If the latter empties his ladle into the edge or basin of the runner box, there will be very little difference of pressure in the mold, no matter how high the ladle is held. Should A, however, hold his ladle as high as shown and pour directly into the runner, the momentum of the falling stream will tend to temporarily raise the pressure in the mold, but it is apparent that there is nothing permanent about this pressure as finally it is determined by the height of the runner box.)

Analyses of Pig Iron.

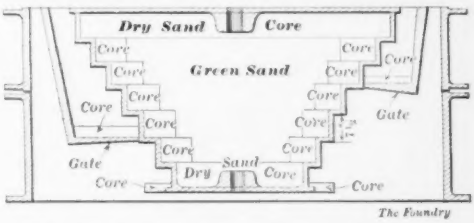
We have just received from Seymour R. Church, 307 Sansome st., San Francisco, California, an advance copy of "Analyses of Pig Iron," which is now being published by Mr. Church. The book contains 120 pages of analyses of different kinds of pig iron made by furnaces in all parts of the world. No work of this kind has heretofore been published and it should be of great value to foundry operators and furnacemen in general, as it gives the location of the principal furnaces in the world, the kind of fuel they use, the ores which enter their product and the analyses of the latter. "Analyses of Pig Iron" is gotten up in elegant shape, is printed on the finest kind of paper, which shows up the half tone illustrations of pig iron fractures in the very best way and the book is beautifully and permanently bound. This work is sold by subscription only and those who desire a copy should arrange for same as soon as possible by addressing the publisher, Seymour R. Church, 307 Sansome st., San Francisco, California. The price of the book is $2.50 to points in the United States and Canada, and 12 shillings to Great Britain and other foreign countries.

Molding Cone Pulleys.

BY CHAS. T. STROTS.

There has lately been illustrated in THE FOUNDRY several methods of molding cone pulleys, and as an addition to the subject I herewith show a sketch of a Western way of molding the larger sizes of these castings.

Some eight or ten years ago we made two pulleys as shown in the illustration, with the exception that we cast a pinion on the



small end. The latter was rammed up in a piece of wrought iron pipe and put in the core oven over night to dry. The only patterns we used were ordinary pulley rims, and for both mold and cores we did not spend two dollars for pattern labor.

Both pulleys made at that time came out perfect, and since then we have made many complicated castings, practically following the same plan of molding.

Werner & Pfleiderer of Saginaw, Mich., write us that they use castings made of the very best "charcoal iron," and desire to obtain the addresses of foundrymen who make a specialty of furnishing these.

Received from the Trade.

Catalogue describing the Millett Core Oven and the Millett Brass Furnace. For free copy, address The Millett Core Oven Co., Brightwood, Mass.

Catalogue illustrating the product of the Bickford Drill & Tool Co., Cincinnati, Ohio. Special attention is called to four spindle radiator drill, for boring and facing radiators. Copy of this catalogue sent upon application.

Pamphlet describing the "Victoria," New Type, Gear Cutting Machines, built by Gould & Eberhardt, Newark, N. J. Copy sent to those who ask for it.

Pamphlet illustrating the Peerless Vertical Gas Engine, built for stationary duty only. Write the Northern Engineering Works, Detroit, Mich., for copy of same.

Catalogue of Gas Exhausters and Pressure Blowers, made by Wilbraham Baker Blower Co., Philadelphia. Describes new patterns made by this company. Sent to interested parties upon application.

Catalogue No. 8, issue by the Stow Mfg. Co., Binghamton, N. Y. Describes the use of flexible shafts for a great many purposes, including the grinding and polishing of castings. For copy address the manufacturers.

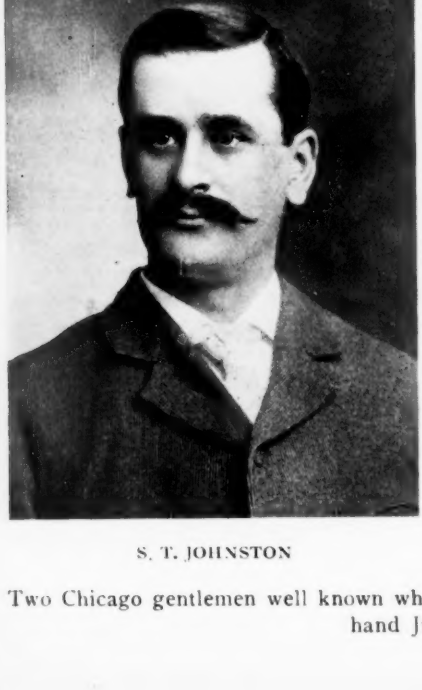
Catalogue of S. R. Church, San Francisco, Cal., Fire Brick, Pig Iron and Foundry Supplies in general. Copy for the asking.

Lecture on "Mechanical Ventilation and Heating by a Forced Circulation of Warm Air," delivered at Cornell University by Walter B. Snow, of the engineering staff of the B. F. Sturtevant Co., Boston, Mass. Applications for free copies should be addressed to the B. F. Sturtevant Co.

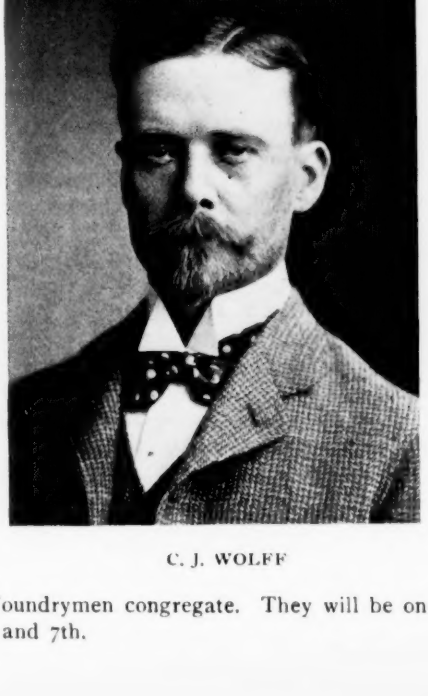
Catalogue of the Farwell Molding Machine, made by the Adams Co., Dubuque, Iowa. Contains detailed description of a variety of molding machines. Copies may be had from the manufacturers gratis.

Catalogue of C. H. Green & Co., Syracuse, N. Y. Illustrates the Eureka Snap Flask, made to conform to all shapes of patterns as well as in standard sizes. Solid Box Flasks are also made by this Company, who will mail their catalogue upon request.

Joseph McDonald, who for some time past has been connected with the Allegheny plant of the Westinghouse Electric & Manufacturing Co. in the capacity of foundry foreman, has accepted a position with Thomas Carlins' Sons Company, of Allegheny, Pa., as foundry manager.



S. T. JOHNSTON



C. J. WOLFF

Two Chicago gentlemen well known wherever Foundrymen congregate. They will be on hand June 5, 6 and 7th.